WWII

ANNOTATED IN 3D: YAMATO, GRAF SPEE, ENTERPRISE AND MORE

Bringing History to Life

End of the battleships

How the sinking of HMS Prince of Wales and HMS Repulse was historic

Queens of the sea

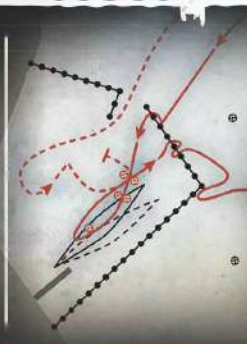
How aircraft carriers took control of the world's oceans

WAR AT SEA



HITLER'S ADMIRAL

Erich Raeder led the Kriegsmarine's 'cruiser war'



THE HUNT FOR TIRPITZ

Step by step: How Britain finally sunk Germany's prize battleship



U-BOAT WAR

German wolf packs terrorised Allied convoys

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NAVAL HISTORY AND HERITAGE COMMAND

Deadly beasts of the oceans

The greatest war machines in history are without doubt warships. Throughout the ages, they have spread fear and wonder around the world – not least because of the gunboat diplomacy of the great powers. It was long believed that whoever had the best navy ruled the seas.

Civilian shipping across the Atlantic was vital to virtually every warring party within Europe. Britain, in particular, was dependent on sea transport and had the strongest naval fleet in the world at the start of the war. With the showdown in the Pacific, the balance of power shifted, and by the end of the war, the United States held this honour. However, the US Navy differed radically from the British due to its development of technology.

"Shipping was vital to every warring party"

In this special issue, we've collected our best articles on World War II warships. Read about gigantic constructions, such as the *Tirpitz* and *Yamato*, about submarine hunting and convoy warfare, and about the birth of aircraft carriers and the death of battleships.

Enjoy!

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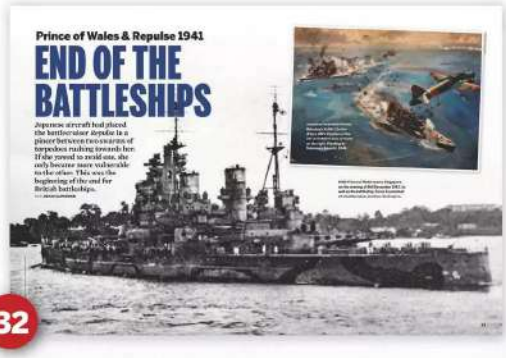
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The Japanese battleship *Yamato* was the largest and most heavily armed warship ever built.



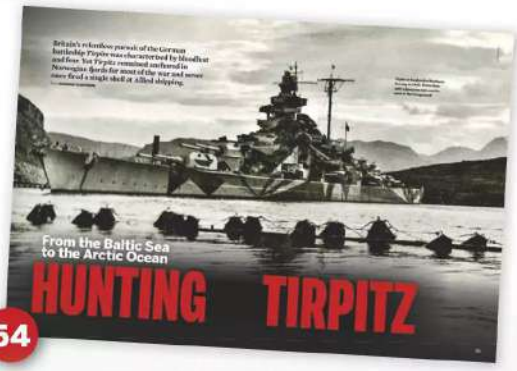
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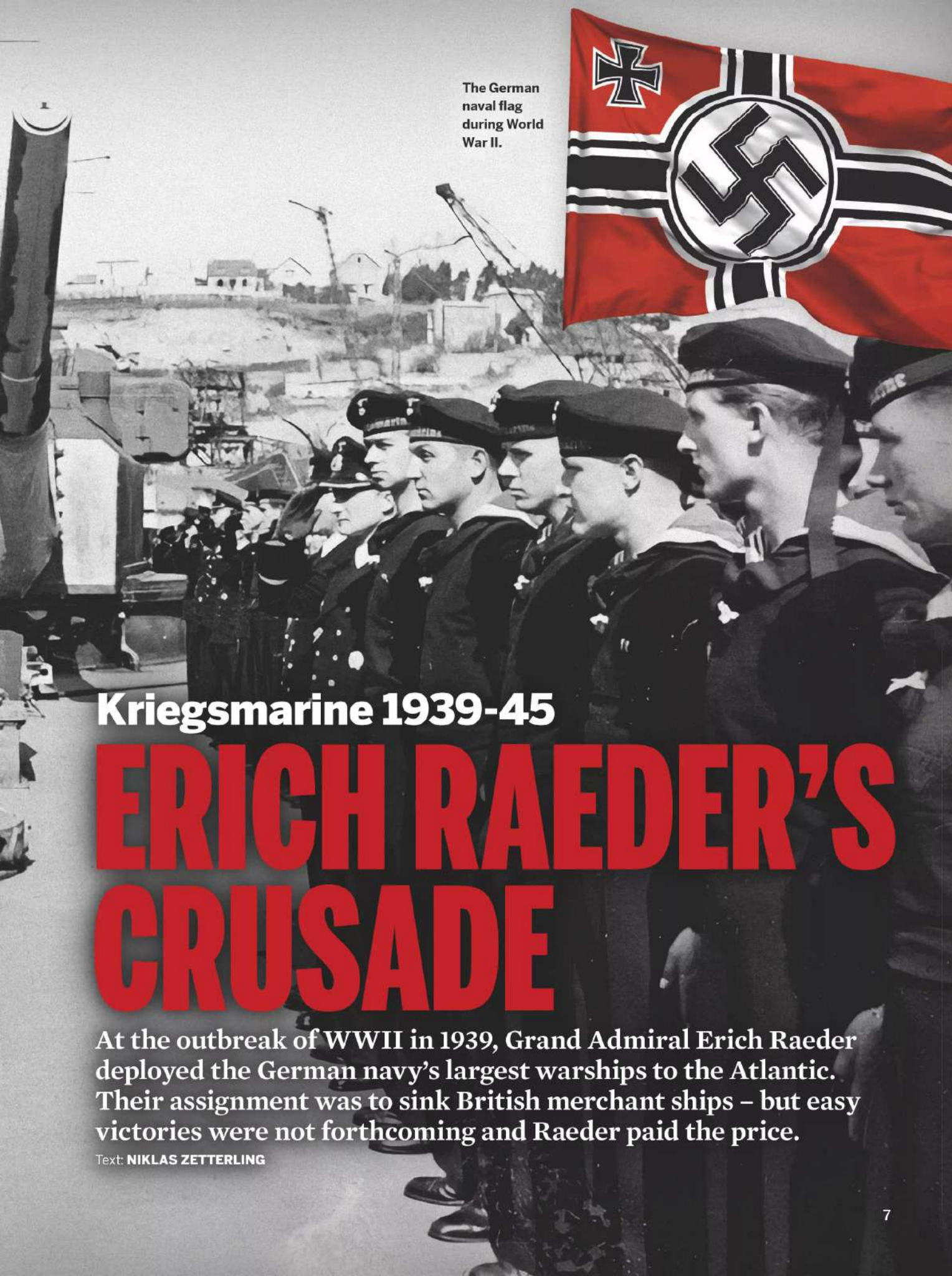
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Commander-in-chief of the Kriegsmarine, Grand Admiral Erich Raeder (in leather coat), inspects the battlecruiser *Gneisenau* in Brest in 1941.

HISTORIE ARCHIVE



The German naval flag during World War II.

Kriegsmarine 1939-45

ERICH RAEDER'S CRUSADE

At the outbreak of WWII in 1939, Grand Admiral Erich Raeder deployed the German navy's largest warships to the Atlantic. Their assignment was to sink British merchant ships – but easy victories were not forthcoming and Raeder paid the price.

Text: **NIKLAS ZETTERLING**

In June 1941, Grand Admiral Erich Raeder realised that his strategy for the German navy wasn't working. He'd been in command of the fleet since 1928 and had worked tirelessly to improve his service branch's status in the German Wehrmacht. However, recent events, coupled with a switch of focus on a new front, meant an end to Raeder's plan.

By 27th May, Raeder's most powerful ship, the battleship *Bismarck*, had been sunk on her first mission. At the same time, something equally alarming was further undermining the German naval strategy: most of its supply ships stationed around the Atlantic had been sunk or captured by the Allies. Their role had been to make it possible for German ships to replenish supplies – and in particular fuel – at sea, enabling them to carry out operations over longer periods of time and at greater distances. Finally, the most important incident had yet to occur, but Raeder was well aware of what was about to happen. At dawn on 22nd June, the German armed forces would invade the Soviet Union, thus concentrating all resources on the land war.



Erich Raeder (1876-1960) led Germany's naval rearmament in 1928-39. He was promoted to grand admiral in 1939.

BUNDESARCHIV, BILD 146-1980-128-63 / CC-BY-SA 3.0

TO UNDERSTAND WHY these events had such an impact on Raeder's tactics, we need to look back. The peace agreements after World War I had meant the German navy had been greatly weakened. This changed when Hitler came to power in 1933 and Germany began to rearm. In 1935, an agreement was reached with the United Kingdom that gave Germany the right to build its own battleships with a total weight of 35 per cent of that of the British battleship fleet. Within this total, the Germans were allowed to build the same number of submarines as the British, which meant that both countries had 57 submarines at the outbreak of war in 1939. Hitler was extremely pleased with the agreement, which he claimed would rule out a war with Britain for the next ten years – until 1945. In addition, the agreement gave such a wide scope for naval rearmament that budgetary constraints were the only real limit.

When Hitler changed his mind in early 1939 and declared that Britain should still be considered a potential enemy, German naval command drew up Plan Z, an ambitious rearmament of its forces due to be completed by 1945. But even if they'd been fully deployed, the German Kriegsmarine would still have not been comparable with the Royal Navy at the outbreak of war. Plan Z's time was cut brutally short, however. When war broke out, resources were prioritised for the army and air force, and the ambitious plan was scrapped. After some discussion, it was decided that those heavy

warships under construction would be completed, but no new shipbuilding would be started.

The German navy's numerical inferiority contributed greatly to the design of Raeder's strategy, which had to find a way to strike the enemy without allowing them to exploit their own superior forces. Britain was seen as the main enemy and its advantages included strong naval forces and excellent access to bases.

THE GERMANS ENVISAGED several ways to attack British shipping. The first was in the same manner as in World War I – namely, with submarines. Plan Z included 190 U-boats, which may seem a significant figure, but represented a small proportion of the planned overall investment. One reason for their low priority was that many believed that countermeasures, such as British sonar, would make it easy to detect and combat submarines.

Another option was air power, but with the limited range of aircraft in the 1930s, attacks on British ports were hardly an option. This left the option of using surface ships. For operations in the Atlantic, ships at least the size of a cruiser were necessary because smaller ships had too small a range of action. Therefore, the Kriegsmarine decided to focus on cruiser warfare. This meant that warships, alone or in small groups, would attack enemy merchant ships on the high seas, while avoiding combat with the foe's superior forces. The aim was to hit British imports and thus cut off the island nation's supplies.

"THE GERMAN NAVY'S NUMERICAL INFERIORITY CONTRIBUTED GREATLY TO RAEDER'S STRATEGY"

At the end of August 1939, only two suitable ships were available for operations in the Atlantic: *Admiral Graf Spee* and *Deutschland*. They were then classified as *Panzerschiff* (armoured ships), but later redesignated heavy cruisers after the British nicknamed them pocket battleships. They left German ports before September 1939 and took up positions in the Atlantic, where they awaited orders. At the outbreak of war, Hitler was not yet prepared to authorise attacks on British shipping, but he quickly changed his mind. At the end of September, the two ships received orders to sink British merchant ships.

Once the order was received, they began searching for suitable victims – *Deutschland* scoured the North Atlantic and *Admiral Graf Spee* operated in the South Atlantic. However, they enjoyed only limited success. They captured (or sank) just three ►



The heavy cruiser *Deutschland* in Naples harbour in 1938.

NATIONAAL ARCHIEF

► and nine ships respectively during these operations. *Deutschland* managed to return home unharmed, while *Admiral Graf Spee* was scuttled by her own crew after being damaged in action off Uruguay.

IN THE AUTUMN of 1939, the battleships *Scharnhorst* and *Gneisenau* also attempted to gain entry to the Atlantic but encountered British naval forces patrolling the waters between the British Isles and Iceland. The Home Fleet was in the area to try to catch the returning *Deutschland*. It failed to do so, but its mere presence prompted the two German battleships to return to Wilhelmshaven.

The German cruiser war in 1939 paid far too little dividends, with 12 merchant ships sunk at the cost of one of their own cruisers. A major issue was the location of German bases on the North Sea coast, which were easy to block. The invasion of Norway in April 1940 provided bases along the Norwegian Atlantic coast, which greatly improved the situation, but the invasion took a heavy toll, with extensive ship losses. The most notorious was the sinking of the brand-new heavy cruiser *Blücher* at Oscarsborg in the Oslo Fjord, but numerous destroyers and two light cruisers were also lost. In addition, several important ships were so badly damaged that repair work put them out of action for months.

Finally, the occupation of France the following month provided useful bases with open water facing the Atlantic. However, when preparations for an invasion of Britain (the never-realised Operation Sea Lion) began in the summer of 1940, much of the Kriegsmarine's resources were tied up.

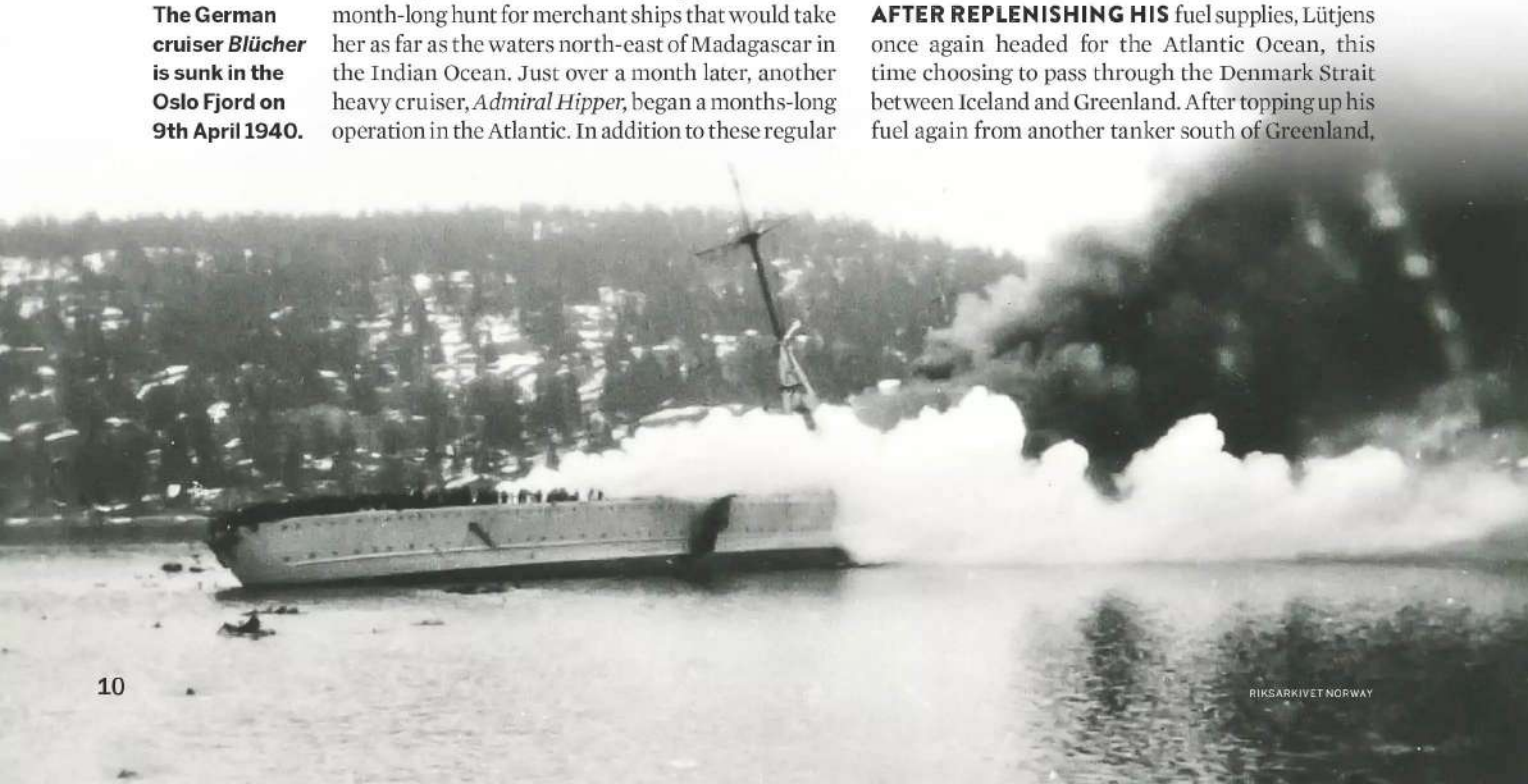
It was only on 23rd October 1940 that German ships were able to resume operations in the Atlantic. Then the heavy cruiser *Admiral Scheer* began a nearly six-month-long hunt for merchant ships that would take her as far as the waters north-east of Madagascar in the Indian Ocean. Just over a month later, another heavy cruiser, *Admiral Hipper*, began a months-long operation in the Atlantic. In addition to these regular warships, the Germans also sent out converted merchant ships, known as auxiliary cruisers. They were armed with older guns mounted in such a way that they were mostly concealed, enabling the ships to appear to be neutral merchant ships. This made it possible to get close to their intended victims while evading enemy warships.

None of these efforts produced decisive results. *Admiral Scheer* sank 17 merchant ships and *Admiral Hipper* at least eight. These were insignificant figures compared to the large number of ships transporting supplies to and from the British Isles. However, German naval command could take comfort in the fact that the operations undertaken so far were on a small scale and with relatively weak ships. In early 1941, a much bigger operation was planned.

The two battleships *Gneisenau* and *Scharnhorst* would sail from Kiel in what was dubbed Operation Berlin. This became the textbook example of German naval cruiser warfare and deserves close examination. The enterprise began on 22nd January 1941 when the two battleships left Kiel and headed for the Danish Great Belt. From there, the unit proceeded towards the seas south of Iceland. *Gneisenau's* commander, Admiral Lütjens, hoped to pass through these waters unnoticed to gain access to the Atlantic convoy routes.

However, the British had received intelligence indicating that a German breakout was imminent and the head of the Home Fleet, Admiral Tovey, took up a position south of Iceland to block the Germans. At this point of the war, the Germans had superior radar and detected the British ships in time, prompting Lütjens to turn towards the Arctic Ocean, where a supply tanker awaited.

AFTER REPLENISHING HIS fuel supplies, Lütjens once again headed for the Atlantic Ocean, this time choosing to pass through the Denmark Strait between Iceland and Greenland. After topping up his fuel again from another tanker south of Greenland,



The German cruiser *Blücher* is sunk in the Oslo Fjord on 9th April 1940.

RIKSARKIVET NORWAY



Erich Raeder and Karl Dönitz, commander of submarines, had argued over how the fleet's resources were divided up. When Raeder resigned, he tried to convince Hitler not to appoint Dönitz as his successor.

BILDARCHIV PREUSSISCHER KULTURBESITZ

Lütjens could begin his primary mission: finding convoys and sinking merchant ships. However, this proved to be more difficult than expected. The seas were vast and observation possibilities from a battleship were limited, even with radar.

When Lütjens spotted a convoy on 8th February, it turned out to be escorted by the battleship *Ramillies*. Engaging with equal or superior ships violated the orders Lütjens had received. *Ramillies* with her 38-cm guns was more heavily armed than both German battleships, which meant that Lütjens avoided the convoy instead of attacking it. This tactic was understandable given the circumstances. Damage to German ships had to be avoided, as it might reduce their speed, making them unable to outrun enemy naval forces and return to home ports for repairs. The strategy was also based on being able to surprise convoys. If German ships unnecessarily engaged in combat, their position was revealed, which the British could use to redirect other convoys.

The British convoy had observed *Gneisenau* but identified her as a small cruiser and thus did not fully realise the threat. They also believed that the supposed cruiser was heading home and so deployed naval forces to block her passage to German ports.

While waiting for the British to lower their guard, Lütjens replenished fuel supplies from tankers before resuming his search for convoys. On 16th February, he was again ready to start searching along the convoy routes from Halifax in Canada. After a few days, the first merchant ship was found. Because it was alone, Lütjens did not attack so as not to give away his position. He wanted to avoid being discovered until a whole convoy could be attacked.

"HITLER EVEN ORDERED THAT THE HEAVY SHIPS BE DISARMED"

ONLY ON 21ST February, when the Germans were so far west that they thought the convoys had been disbanded and the ships were heading for various ports along the North American eastern seaboard, did they achieve success. They found and sank five merchant ships, which was a moderate yield after weeks of searching. As a result, Lütjens decided to try his luck on the British convoy routes that ran along the west coast of Africa instead.

In early March, Lütjens reached the area where his two battleships would search for victims. Again, the results were poor. A heavily escorted convoy was discovered, but in accordance with his instructions, Lütjens chose not to attack. However, he managed ▶



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Karl Dönitz (1891-1980) was Commander of the Submarines from 1935 to 1943, and was promoted to grand admiral in 1943, succeeding Erich Raeder as commander-in-chief of the German navy.

► to ensure that U-boats were directed to attack and sink five of the merchant ships.

After six weeks at sea, Lütjens's crews were exhausted, and his ships needed refitting. However, he wanted to make one last attempt to achieve a noteworthy success before the naval force headed back. Again, his eyes fell on the area east of the American coast. This time the Germans had better luck. A convoy that had started to split up was found and several merchant ships were sunk. Lütjens achieved the success he wanted to end the operation and then set course for Brest, where his two battleships arrived on 22nd March.

IN TOTAL, THE two German battleships sank 22 merchant ships during the operation. Significantly more would have been needed to seriously threaten British imports. Despite this, Operation Berlin was the most successful German operation in the cruiser war to date.

There were several reasons for its lack of success. One of the most important was intelligence. It was difficult for the Germans to get an idea of the timing and speed of the convoys. In addition, the possibilities for observation at sea were limited due to the ocean's size and the few German ships available. Although they enjoyed an advantage in terms of radar, it still only had a range of just over 20 kilometres.

The fact that several British convoys were heavily escorted was also a major problem. The cruiser warfare concept was based on the German ships having an advantage in terms of speed and range of action. In most cases, the modern German warships fulfilled this, but the margins were tight enough that taking damage could remove these advantages. Going into battle with a strong convoy escort was therefore unacceptable.

All in all, the experience of Operation Berlin revealed that it would be difficult to find suitable victims in circumstances favourable enough that they could be attacked in relative safety. In addition, the Germans feared that the British would also equip their ships with high-performance radar, seriously increasing the risk to German cruisers when attempting to traverse the North Sea. Radar would also make it easier for the British to track German supply ships in the Atlantic. Without those, the German strategy was doomed because the distances to home ports were so far.

DESPITE THESE CONCERNS, Raeder decided to continue the cruiser war. After Operation Berlin, he planned to carry out Operation Rheinübung, a combined operation involving *Gneisenau* and *Scharnhorst*, as well as the brand-new battleship *Bismarck* and the equally new heavy cruiser *Prinz Eugen*. *Scharnhorst* had suffered damage to her propulsion machinery, which meant that she would not be ready for action until the summer of 1941, while *Gneisenau* was hit by a torpedo while moored

in Brest. The operation was thus restricted to just *Bismarck* and *Prinz Eugen*.

One reason the German navy pursued the plan was that the upcoming invasion of the Soviet Union, Operation Barbarossa, was about to begin. Raeder wanted a success before attention turned east.

Operation Rheinübung resulted in a very serious setback for the Germans and the end of the cruiser war. Through a series of unfortunate events, *Bismarck* became impossible to steer on the evening of 26th May and was sunk by a superior British naval force the following day. The loss of the state-of-the-art battleship was a particularly severe one, and the setbacks continued. Over the next two weeks, the British sank or captured most of the German supply ships in the Atlantic, eliminating the possibility of refuelling at sea.

Attacks on British convoys had been the primary focus of the Kriegsmarine in the run-up to World War II. Raeder had devoted most of his limited resources to this. By June 1941, it was clear that the strategy had failed, and this meant, of course, extremely serious consequences for the supreme commander of the German navy. There were several reasons for this, but the key one was that the strategy had been based on false premises.

First, it assumed the Germans would have an easy time finding the convoys, while the British would have a hard time spotting the German ships. But while the vastness of the Atlantic Ocean and its frequently poor visibility provided the basis for the Germans' ability to avoid detection, it also meant the convoys were more difficult to find.

Another German dilemma was the need for greater speed, to make it possible to choose when to engage and when to avoid combat. In addition, their ships needed to operate over vast distances without compromising the requirements for firepower and strong armour protection. This led the Germans to use compact propulsion machines that operated at very high pressures. The systems were advanced and performed well but weren't reliable enough. They needed frequent overhauls, requiring long periods in the shipyard, which meant that they could not operate across the Atlantic Ocean to the extent desired.

OVERALL, IT'S CLEAR that German hopes were unrealistic. There was little chance of finding the convoys with the frequency necessary to choke off British imports. Added to this was the low availability of German ships. The number of merchant ships sunk by Germany's surface fleet was therefore small, especially compared to what the U-boats achieved. In total, the Germans sank over ten million tonnes of Allied merchant tonnage throughout the war, with heavy warships accounting for less than five per cent of this figure. Even during the period of Operation Berlin, the most successful German surface ship operation, submarines accounted for more than half of Allied ship losses.

"RAEDER RESIGNED IN PROTEST AND DÖNITZ BECAME THE NAVY'S NEW COMMANDER-IN-CHIEF"

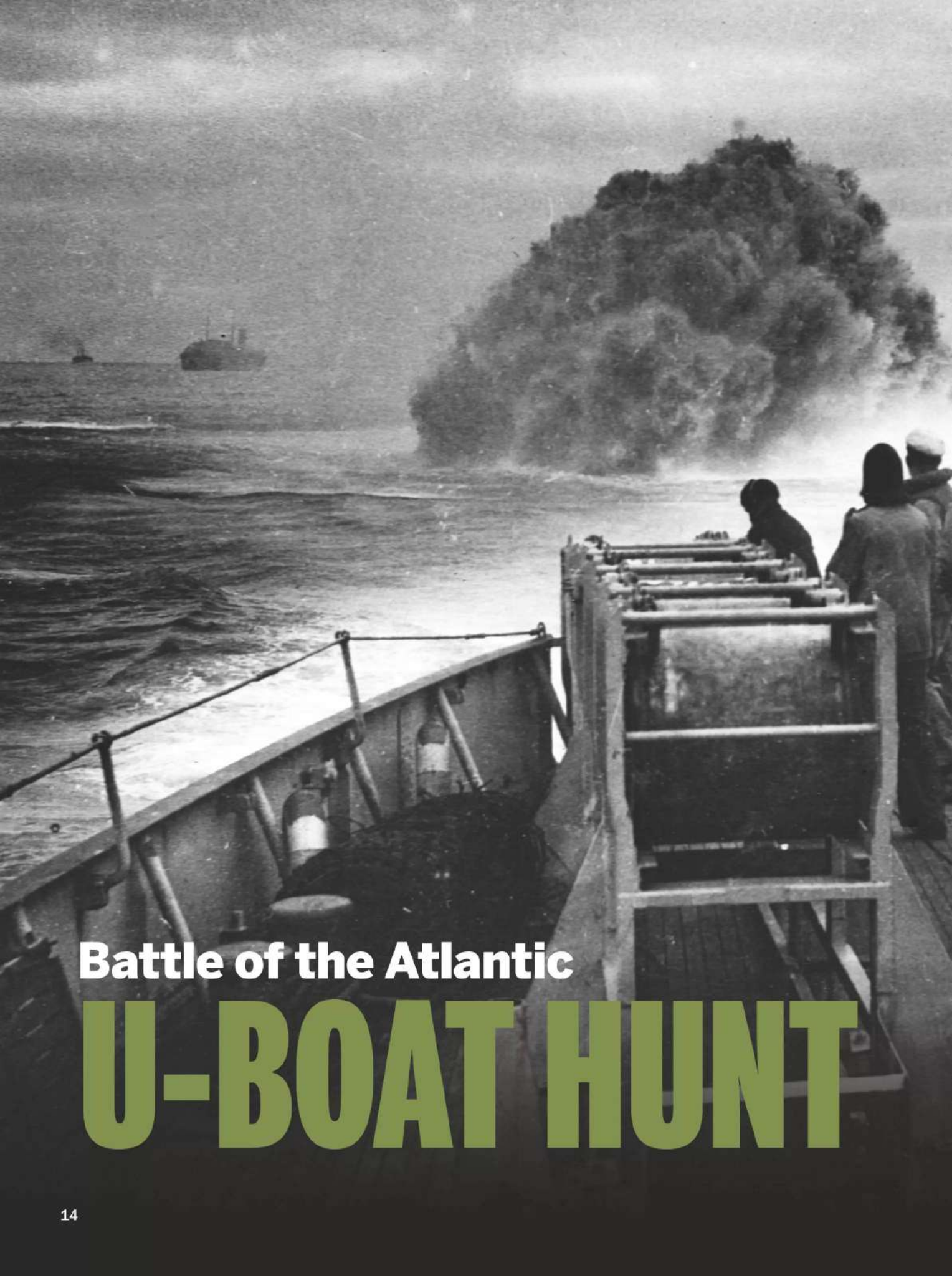
This was the harsh truth that Grand Admiral Raeder had to face in June 1941, but he appeared to have been reluctant to write off cruiser warfare altogether. Proposals to send the new battleship *Tirpitz* into the Atlantic were discussed in the second half of 1941, but never materialised. The invasion of the Soviet Union also meant that the fuel supplies provided by Stalin were terminated, which was another major setback for the German navy.

WHILE ADMIRAL KARL Dönitz's submarines were increasingly successful in the Atlantic, the remaining heavy surface ships were moved to Northern Norway. The idea was that from there they could be deployed against Allied convoys in the Arctic Ocean en route to the Soviet ports of Arkhangelsk and Murmansk. But even in this theatre of war, it was submarines and aircraft, not surface ships, that accounted for virtually all Allied merchant tonnage sunk. In December 1942, the Germans tried to attack a convoy north of Norway in the Barents Sea. But difficult weather and the valiant resistance of the weak British escort meant that the cruisers *Admiral Hipper* and *Lützow*, along with six destroyers, failed to sink any of the convoy's 14 merchant ships.

A furious Hitler chastised Raeder for spending millions of Reichsmarks on useless artillery ships while the U-boats performed admirably. Hitler even ordered that the heavy ships be disarmed, and their guns installed as coastal artillery. Raeder resigned in protest and his rival Dönitz became the navy's new commander-in-chief. Although Dönitz persuaded Hitler not to disarm the fleet as the ships in Norway tied up considerable Allied escort resources, the U-boats were finally given top priority.

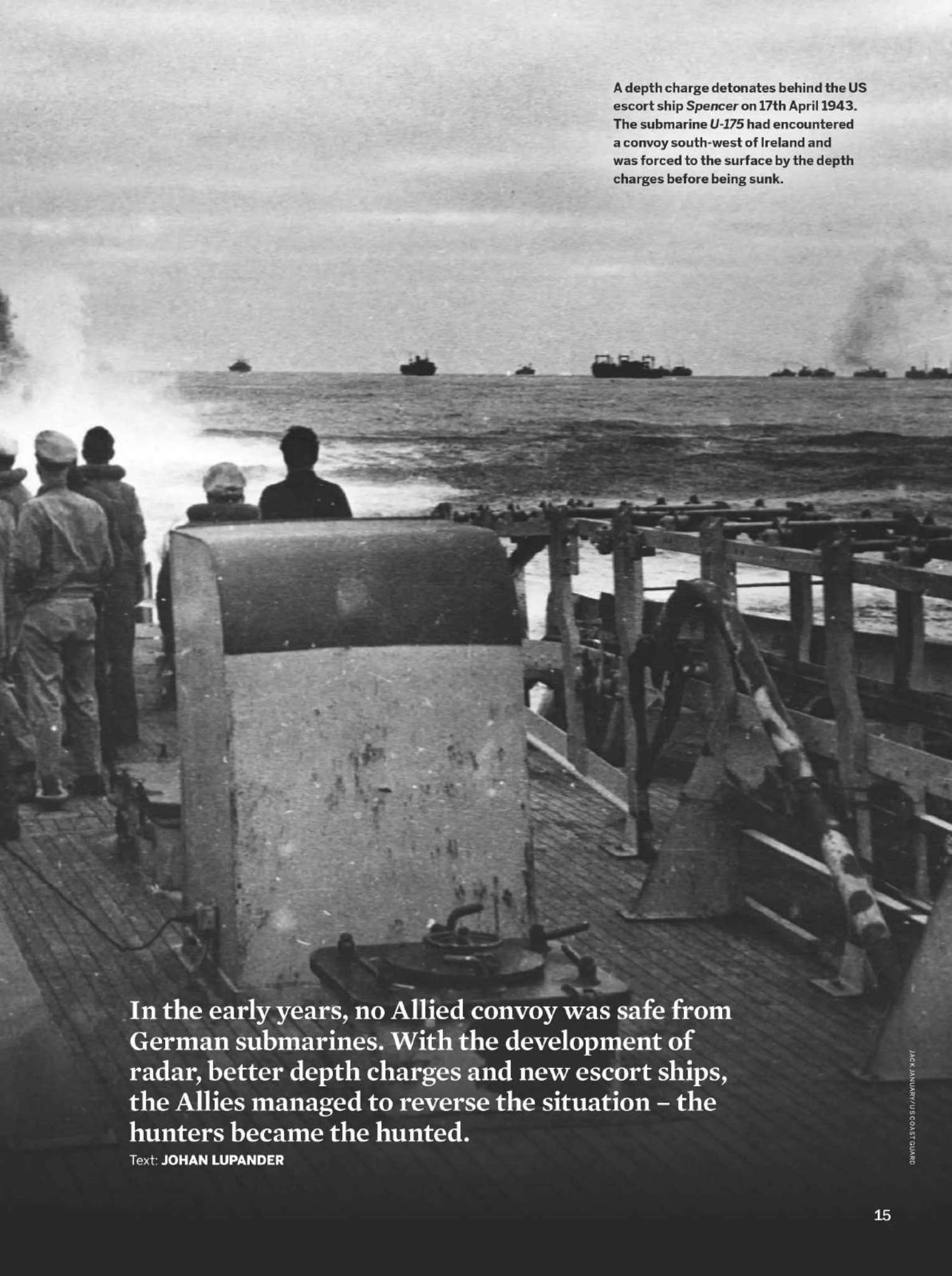
With the benefit of hindsight, it's easy to see that the Kriegsmarine investment in surface-based ships was misguided in many ways. The resources allocated were insufficient to give the chosen strategy a chance of success; it would probably have been better to invest in submarines. The concept was an attempt to win despite inferior resources, but critical flaws in the plan helped ultimately to undermine cruiser warfare.

Niklas Zetterling is a military history writer/author.



Battle of the Atlantic

U-BOAT HUNT



A depth charge detonates behind the US escort ship *Spencer* on 17th April 1943. The submarine *U-175* had encountered a convoy south-west of Ireland and was forced to the surface by the depth charges before being sunk.

In the early years, no Allied convoy was safe from German submarines. With the development of radar, better depth charges and new escort ships, the Allies managed to reverse the situation – the hunters became the hunted.

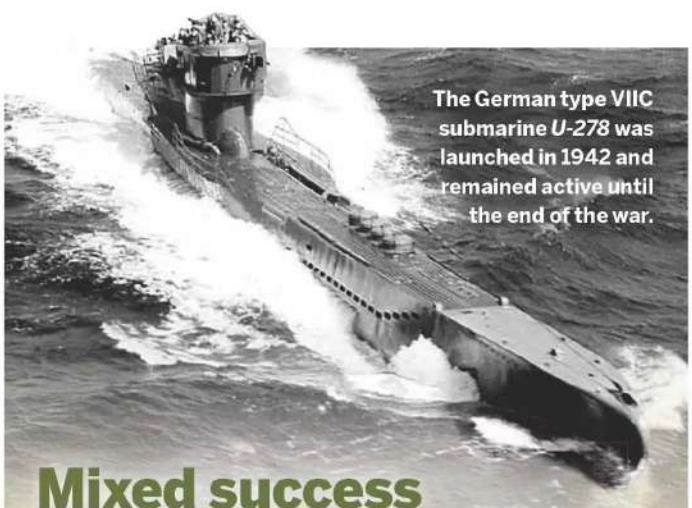
Text: **JOHAN LUPANDER**

JACK JANUARY/U.S COAST GUARD

The British escort destroyer *Pelican's* radar screen showed a clear echo as it moved at top speed through the dense fog. The radar operator shouted out bearings and distances, the two 10.5-cm gun turrets swung out on the stern deck, and the crew set depth charges to detonate at minimum depth. It was time to surprise a U-boat on the surface.

The first lookout to spot the target called out. A few seconds later, the *Pelican's* guns roared and hurled their shells at the dark shape, which was already diving into a cloud of water and foam. Another salvo cascaded around the submarine's conning tower before it disappeared into the depths. Now the sonar operator took responsibility for tracking the enemy, noting that the sub was right ahead. As *Pelican* crossed the submarine's wake, her depth charges slammed out their deadly load, while the launchers, with their dull thuds, hurled bombs from the ship. After only a few seconds, the depth charges began to detonate with a prolonged roar, sending cascades of water tens of metres into the air.

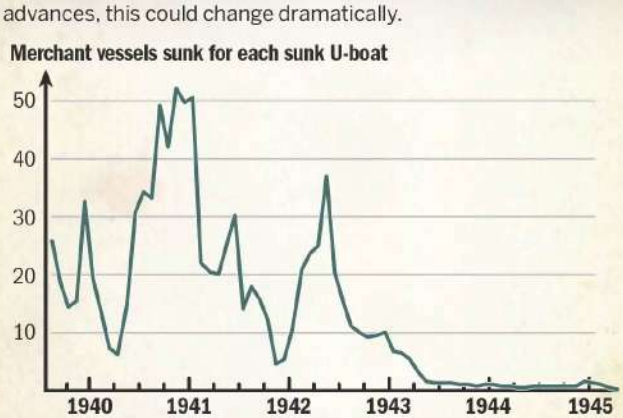
The *Pelican* swung round at full rudder and repeated the attack. Then she pulled away to try to make sonar contact with the target. The sonic pulses radiated out, but there was no echo. Instead, a large patch of diesel oil mixed with floating debris spread across the surface of the sea. On 6th May 1943, the *Pelican* had sunk the German submarine *U-438*, ending months of fighting in the North Atlantic that had caused decisive losses to Germany's arsenal of U-boats. But it had been a long road.



The German type VIIC submarine *U-278* was launched in 1942 and remained active until the end of the war.

Mixed success

★ The loss ratio shows how many Allied ships were sunk per German lost submarine. With various technical or tactical advances, this could change dramatically.



It wasn't all the war's fault

★ Shipping in the first half of the last century was far more primitive and risky than today. A full 16 per cent of ship losses were not due to gunfire; older ships could be wrecked in a storm, quickly built newer ships could suddenly break apart, inexperienced navigators could steer ships aground, cargoes could be displaced with disastrous consequences, ships could collide during the zigzagging of convoys, or fires could break out due to the carelessness of tired or inexperienced crew members.

THE PERIOD FROM September 1939 to December 1941 saw what German U-boat commanders would later refer to as the "Happy Time". They sank or damaged 1,189 merchant ships at the cost of just 68 lost submarines. The loss ratio – the number of merchant ships sunk compared to submarines lost – was 17.5. To this should be added more than 1,300 merchant ships sunk in other ways. Thus, the Allies lost a total of 2,538 merchant ships, while fewer than 400 new British boats were built. The submarines also managed to sink 41 British warships, including two older battleships and three large aircraft carriers.

The early years of the war proved that the Royal Navy's methods and means of anti-submarine warfare and naval defence were inadequate. Britain was saved from being totally cut off by her opponents' mistakes and lack of resources as much as by her own efforts. Nevertheless, since the construction of new merchant ships was thus far outweighed by the losses, the Germans were well on their way to achieving their aim of isolating Britain – which had not been self-sufficient in food and other commodities for hundreds of years – and thereby winning the war.

GERMAN U-BOAT COMMANDERS had quickly realised that the traditional submarine tactic of attacking in daylight when submerged was far less effective than attacking at night from the surface. This allowed the submarine to use its speed advantage, while its relatively small footprint meant that it was rarely detected before an attack – escort vessels still lacked radar. In the early years, submarines mostly operated individually, because there were



HISTORIE ARCHIVE

German crew watch from the submarine's conning tower.

too few to be grouped in units. However, the idea of gathering a number of submarines together to attack a convoy had been posited, and from 1940 it was tried on occasion by a few forward-thinking U-boat commanders. Although this achieved some positive results, there were difficulties, some of which were due to the Germans themselves and Admiral Dönitz's penchant for micro-managing his U-boats.

THE WOLF PACK tactic first grouped the available U-boats in a reconnaissance line, perpendicular to the known Allied convoy routes. This greatly increased the chances of finding a convoy, while providing some solution to the problem of a lack of aerial reconnaissance (only the Luftwaffe, not the Kriegsmarine, had long-range reconnaissance aircraft). The submarine that first sighted a convoy would not attack but instead shadowed it at a safe distance, while the composition, position, course and speed of the convoy was reported by radio to the submarine command centre. As many subs as possible were then directed to a point in front of the convoy. In addition to this reporting, Dönitz required frequent status reports from each U-boat. All this radio traffic was done by Morse code on the short-wave band. The Germans assumed that their pioneering Enigma encryption machine provided adequate protection against Allied signals intelligence efforts to read the messages. However, from 1940 onwards – with some interruptions – this was a completely false assumption. Just as damning, radio signals from the U-boats were relatively easily picked up, revealing the subs' location (less detectable burst transmission was only introduced at the end of the war).

"THE GERMANS ASSUMED THEIR ENCRYPTION MACHINE PROVIDED PROTECTION"

Once the submarines had assembled in front of the convoy, they would launch their attacks in the evening, usually from the surface. Tactical ▶

BATTLE OF THE ATLANTIC

coordination on the spot was neither possible nor necessary. A number of attacks from different directions, even if spread out over a period of time, were often sufficient to overload and disrupt the often too-few escort vessels in the darkness of night.

It would be some time before Allied anti-submarine warfare capabilities were developed to deal with the wolf pack threat.



SA DEVON/ROYAL AIR FORCE/IMPERIAL WAR MUSEUM

An RAF Short Sunderland seaplane over a Canadian convoy of troop carriers on 31st July 1940.

IN 1942, SINKINGS by submarines reached new highs, although more were also lost, and the loss ratio deteriorated to 15 merchant ships sunk for each lost sub. Submarine warfare began to reach its climax with a sharp increase in the number of U-boats pitted against an increasing number of Allied ships and aircraft, equipped with new weapons and reconnaissance capabilities, and improved tactics. No fewer than 86 submarines were sunk, but despite this, Allied losses of cargo and tanker ships rose to 1,574. Since construction of new boats – about a thousand vessels – was still not sufficient to replace the losses, the situation was critical. German shipyards, on the other hand, delivered new submarines at a rate that, despite the losses, increased their total number from 250 to 400 in 1942. Such growth augured well – from the German point of view – for a continuation of U-boat warfare using wolf packs in 1943. On the other hand, there was little development on the technical side of the U-boats and their weapons – why bother with that when submarine warfare was going so well?

On the Allied side, new technology and the availability of specialised escort vessels began to make themselves felt in the U-boat war. Improvements in airborne radar and other aids enabled the British to both find and attack German U-boats as they passed through the Bay of Biscay on their way to areas of operation further out in the Atlantic. It was also possible to organise independently operating anti-submarine forces of four to six escort vessels. Several of these achieved great success – most famously the 2nd Escort Group under the command of its legendary leader, Commander John Walker. New escort carriers also raised hopes that convoys would soon have their own air defences. However, it took time both to introduce these improvements and to learn how to use them, and not everything was in place when the submarine war reached its peak.

THE EARLY MONTHS of 1943 were characterised by a number of convoy battles – skirmishes around a particular convoy lasting several days and involving

U-boat war

From 1939-45, Germany waged unrestricted submarine warfare. This meant that many neutral nations' shipping was also affected, but the German wolf packs primarily pursued the convoys to and from Britain.

Svalbard
BARENTS SEA
Novaya Zemlya
GREENLAND SEA
Jan Mayen
Greenland
Murmansk
Narvik
Britain occupies Iceland on 10th May 1940.
NORWEGIAN SEA
DENMARK STRAIT
ICELAND
Reykjavik
Arkangelsk
SWEDEN
Trondheim
1
Helsinki
Leningrad
Oslo
Stockholm
SOVIET UNION
Merchant ship McKeesport sunk 29/4.
U-710 is sunk 24/4.
Convoy ONS-5 departs Liverpool on 21st April 1943.
Scapa Flow
Riga
Moscow
3
NORTH SEA
Copenhagen
Battles 4th-6th May, 12 merchant ships and 6 U-boats are sunk.
Sunderland
Dublin
Liverpool
Berlin
Warsaw
GERMANY
London
Kyiv
Stalingrad
Plymouth
Paris
Brest
Lorient
St Nazaire
La Pallice
Bordeaux
BAY OF BISCAY
British air patrols over U-boat routes to and from bases.
Bucharest
Vigo
Rome
Madrid
Athens
Azores
Lisbon
Algiers
Portugal grants Britain permission to establish an air base in the Azores in June 1943.
Gibraltar
MEDITERRANEAN SEA
Casablanca
Tripoli
Tobruk
In January 1943, the air base at Gibraltar is large enough to house heavy bombers.
FRENCH WEST AFRICA
Dakar

Where did the U-boats hunt?

1. In 1939-41, the majority of sinkings took place fairly close to the British Isles.
2. As the British got better at anti-submarine warfare and the US joined the war in 1942, the sinkings moved to the east coast of the US.
3. By 1943, Allied air defences were so good that submarines operated mainly in the area between the ranges of land-based aircraft.



The head of the 2nd Escort Group, Commander John Walker (right), on the bridge of his flagship, the escort destroyer *HMS Starling*. Walker became the British Navy's most successful submarine hunter.

C H PARNALL (LT)/ROYAL NAVY/IMPERIAL WAR MUSEUM

many U-boats. Sometimes the merchant ship losses were limited, while on other occasions they amounted to nearly 20. By March, Allied ship losses had reached the same horrific levels as the previous autumn. The Battle of the Atlantic now hung in the balance. An Allied defeat would immediately affect the build-up of forces in Britain, and the supply of materiel in the Mediterranean.

The culmination of these battles, which had raged throughout the winter and spring, were the attacks on the ONS 5 convoy in April and May 1943. They turned the submarine war definitively in the favour of the Allies.

AT THE END of April, a record number of U-boats gathered in the North Atlantic to attack the convoys. Meanwhile, the ongoing intelligence war had shifted in Germany's favour after it modified its Enigma encryption machine so that its cryptographic messages could not, for the moment, be broken. However, this did not affect the Allies' ability to pinpoint the location of transmitting submarines, even if the meaning of the signals was obscured.

On 21st April, convoy ONS 5 sailed from Liverpool on its way to US ports via the northern route near Iceland. It consisted of 42 merchant ships escorted by two destroyers, a frigate and four corvettes. The Germans had anticipated that a convoy would depart soon and take the northerly route, so several wolf packs were ordered to gather across the route and report all contact, but this went unnoticed by British signals intelligence. Although he had now taken over as chief of navy high command and handed leadership of the submarines to his successor, Admiral Dönitz himself was still intensely involved in the impending battle.

"ONLY FOUR U-BOATS COULD CARRY OUT SURFACE ATTACKS THAT EVENING AND NIGHT"

The constant British surveillance of the waters around the British Isles and Iceland by anti-submarine aircraft and ships bore fruit on 24th April when *U-710*, part of one of the wolf packs, was surprised by a Catalina plane on the surface and sunk.

Four days later, the convoy was sighted by *U-650*, which reported its position, course and speed to Dönitz. However, the radio traffic that followed when the wolf pack was ordered to attack and signalled its observations of the enemy was picked



NO. 422 SQUADRON RCAF/IMPERIAL WAR MUSEUM

The German submarine *U-625* under attack by a Canadian Short Sunderland aircraft on 10th March 1944. The plane has dropped depth charges and towards the bow of the sub can be seen machine-gun fire from the rear gunner.

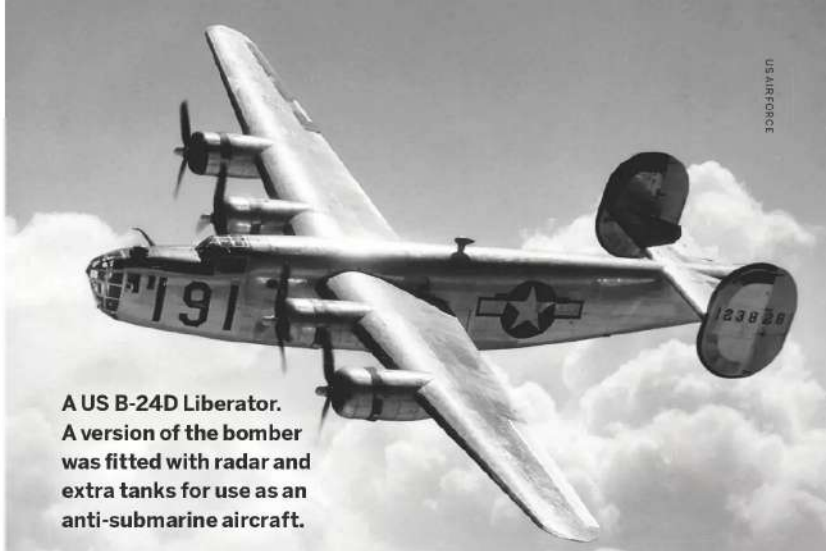
up by the escort vessels, so the convoy changed course in an attempt to lose the enemy. This was reasonably successful and only four U-boats could carry out surface attacks that evening and night. However, these failed completely – only one of them fired torpedoes, and they missed. Two of the submarines were damaged, as well, so they had to break off the battle and head back to base.

The following day, the subs achieved their first success when *U-238* sank a merchant ship in a conventional underwater attack in broad daylight. At the same time, another U-boat was so badly damaged by the convoy's air defences that it too had to return to base. It had now become apparent to British anti-submarine command that convoy ONS 5 was about to encounter an unusually large concentration of U-boats and needed reinforcements. A support group of four destroyers and a destroyer from another convoy were now ordered to join ONS 5.

FOR A GOOD part of the year, the weather in the North Atlantic is dominated by the meeting of warm and cold air currents, with accompanying storms and fog. So it was no surprise that a violent storm over the next few days would leave its mark on the course of events. In the limited visibility, the submarines lost contact with the convoy. But the convoy itself could not stay together in the fog and began to split up, which meant that several of the escort ships had problems with fuel shortages as they followed separate parts of the convoy and were unable to refuel from the group's tankers. On the German side, the pause in action was used to increase the number of U-boats in the area and organise a new line of reconnaissance, mainly for another convoy (SC 128) approaching from the west.

When the storm subsided, the fighting resumed. Two submarines were damaged by air strikes and one of them *(U-209)* disappeared without a trace a few days later while travelling back to base. Meanwhile, convoy ONS 5 was targeted again, this time by *U-628*. Once more, Dönitz concentrated his forces – well over 40 submarines – against the convoy. At the same time, four destroyers had to leave the convoy due to a lack of fuel. As a replacement, the experienced 1st Escort Group of five escort destroyers was sent to the area. The need for them was emphasised by numerous sightings of U-boats, showing how they were concentrated against the now partially reassembled convoy.

THE EVENING OF 4th May began with the sinking of a merchant ship. For several hours, the escort managed to fend off the attacks (which remained on the surface for as long as possible) and damaged three submarines, two so badly that they ▶



US AIRFORCE

A US B-24D Liberator. A version of the bomber was fitted with radar and extra tanks for use as an anti-submarine aircraft.

New escort ships

★ In the early years of the war, a variety of ships were used to protect the convoys, both warships (some from WWI) and armed civilian vessels.

But Britain quickly needed new ships – and lots of them. There was an unglamorous solution: the corvette. This was modelled on a whaling ship. Production was facilitated by the fact that the type was built in a number of civilian shipyards. They were small, slower than the German U-boats in surface mode, underpowered, lacked radar until 1942, and only had a short range (a problem during Atlantic crossings). They were also very uncomfortable and harmful to crews' health. Despite this, corvettes made up over half of all Royal Navy escort ships in the Atlantic and 300 or so were built.

But bigger ships were coming: frigates and sloops. The latter were large, like destroyers, but not as heavily armed and not much faster than a merchant ship. However, they were more enduring than corvettes on trans-Atlantic journeys and became successful and greatly appreciated in escort groups. New frigates arrived in 1942 with weapons, speed and range suited to escort work and anti-submarine warfare.

From 1943, the US Navy also rapidly built escort destroyers similar in size and armament to the British frigates. They were simpler and therefore cheaper to mass produce than regular destroyers. As an emergency solution to improve air defence, some merchant ships were also equipped with a short flight deck or catapult on board. However, they were replaced as soon as possible by escort carriers.



ROYAL NAVY/IMPERIAL WAR MUSEUM

The British escort destroyer *HMS Pelican* sank the sub *U-438* during the ONS 5 convoy battle.

Three key weapons for sub hunters

SONAR

1 The Royal Navy acquired usable sonar (called ASDIC) in the inter-war years and installed experimental models on a number of ships. This enabled submerged submarines to be detected and their position calculated. Optimists thus believed that a possible submarine threat in any future war had been eliminated. The consequence, however, was that people were lulled into a false sense of security and turned a blind eye to the tool's fundamental shortcomings.



HISTORIE ARCHIVE

ASDIC display unit from around 1944.

Sonar had a blind zone extending some 400 metres around the escort vessel. The ship had to sail over the submarine to drop its bombs, which needed time to sink to the set depth. This meant that the submarine had at least a minute and often more to move from its last known position before the bombs detonated. In this time, the U-boat could move 100-250 metres.

RADAR

2 With radar, the Allies had a technological advantage that would be of great importance. Escort ships were equipped with radar in 1941-42, while submarines lacked this important tool for most of the war. In the last months of 1941, the Royal Navy began to take advantage of this and other new technological systems and concepts that completely changed things for the protection of shipping.



IMPERIAL WAR MUSEUM

HMS *Swiftsure* with Type 274 radar installation.

Once Type 271 radar had been installed on ships and people had learned how to use it effectively, it was no longer a given that submarines could operate unnoticed on the surface at night or in poor visibility. In good conditions, the radar could detect a submarine at 10-15 kilometres and a periscope at one kilometre. This meant that what had previously often been a quick surface attack under cover of darkness might now be an encounter with an escort vessel and gunfire that forced the submarine to dive and abort the attack, at least for the moment. Anti-submarine aircraft also began to be fitted with radar.

DEPTH CHARGES

3 For several years, the only weapon the escort ships had against submerged submarines was a variant of the depth charge developed during the previous war. They had several disadvantages:

- They sank slowly (at about 3 m/s) and firing them from the stern or over the side gave the submarine time for evasive manoeuvres.
- They had to detonate within a few metres of the target, which was made more difficult by the fact that they detonated at a pre-set depth, regardless of the distance to the target (in 1939, the Royal Navy's depth charge had a maximum adjustable detonation depth of 90 metres, a depth the German U-boats could easily exceed).
- The detonation produced a large cloud of gas in the water that interfered with the escort vessel's sonar for several minutes.



ROYAL NAVY/IMPERIAL WAR MUSEUM

In 1942, the British began equipping escort ships with the Hedgehog anti-submarine weapon.

In 1942, a new weapon was introduced that reduced the problem of losing sonar contact in the final phase of a depth charge attack. It was the Hedgehog anti-submarine gun, which fired a swarm of 24 rockets about 250 metres ahead of the ship. There, the rockets sank much faster than a normal depth charge (7 m/s) and only detonated if they hit the U-boat hull. They did not interfere with the sonar if they missed, but direct hits were required.

► had to return to base. But in the long run, the convoy escorts were unable to keep up. One submarine attacked in front of the convoy and caused confusion by diving, going beneath the convoy and then sinking a ship. Three other U-boats reached firing positions, fired 13 torpedoes and sank or damaged five merchant ships. The battle continued at dawn, now with the submarines submerged. Four more ships fell victim to torpedoes during the day, but one U-boat was sunk and another badly damaged. Behind the convoy was a small group of stragglers protected by a corvette. While this was busy sinking a first attacker, the next U-boat took the opportunity to torpedo one of the ships in the group. In the evening, the battle hung in the balance as a B-24 aircraft helped keep pursuing U-boats at bay. This was necessary – at dusk, the escort destroyer *Tay* counted seven U-boats on the surface, waiting to launch new attacks in the darkness. At the same time, Dönitz's headquarters noted that at least 15 U-boats were in contact with the convoy, whose escort ships were running low on depth charges after the previous night and day's fighting.

HOWEVER, THE BATTLE changed character again when the convoy entered a large area of thick fog. The submarines – which had no radar – were operating almost blind and found it extremely difficult to launch any attacks, while the escort ships, with their radar, had control of the situation on the surface. A further factor in the escorts' favour was that the Germans had not yet figured out that the British Type 271 radar operated at centimetre wavelengths. Consequently, the U-boats had no warning for this frequency range and were vulnerable to surprise attacks in the fog. One example was the sinking of *U-438*, described earlier.

DURING THE NIGHT, the U-boats carried out some 25 unsuccessful attacks, guided by the sounds of propellers and engines on their sonar. Four subs were sunk and three more damaged – one survived being rammed. As the morning of 6th May dawned, the escort ships had almost run out of depth charges, but the situation was saved by the arrival of the 1st Escort Group. Its ships kept the U-boats at bay, sinking one and damaging at least one more.

When the results of the battles of the previous nights and days became clear to the Germans, they immediately decided to suspend the battle for reorganisation. It turned out that only half of the U-boats at their disposal were still fit for combat. Six of them had been sunk while seven submarines had been so badly damaged that they were now on their way back to their bases. This was the price of sinking 12 merchant ships – a totally unacceptable loss ratio. What was also very worrying for the future was that

"THE BATTLE CONTINUED AT DAWN, NOW WITH THE SUBMARINES SUBMERGED"

this large collection of U-boats had been defeated by the convoy's escort ships (the Germans didn't know how much they had been improved), without any significant input from anti-submarine aircraft.

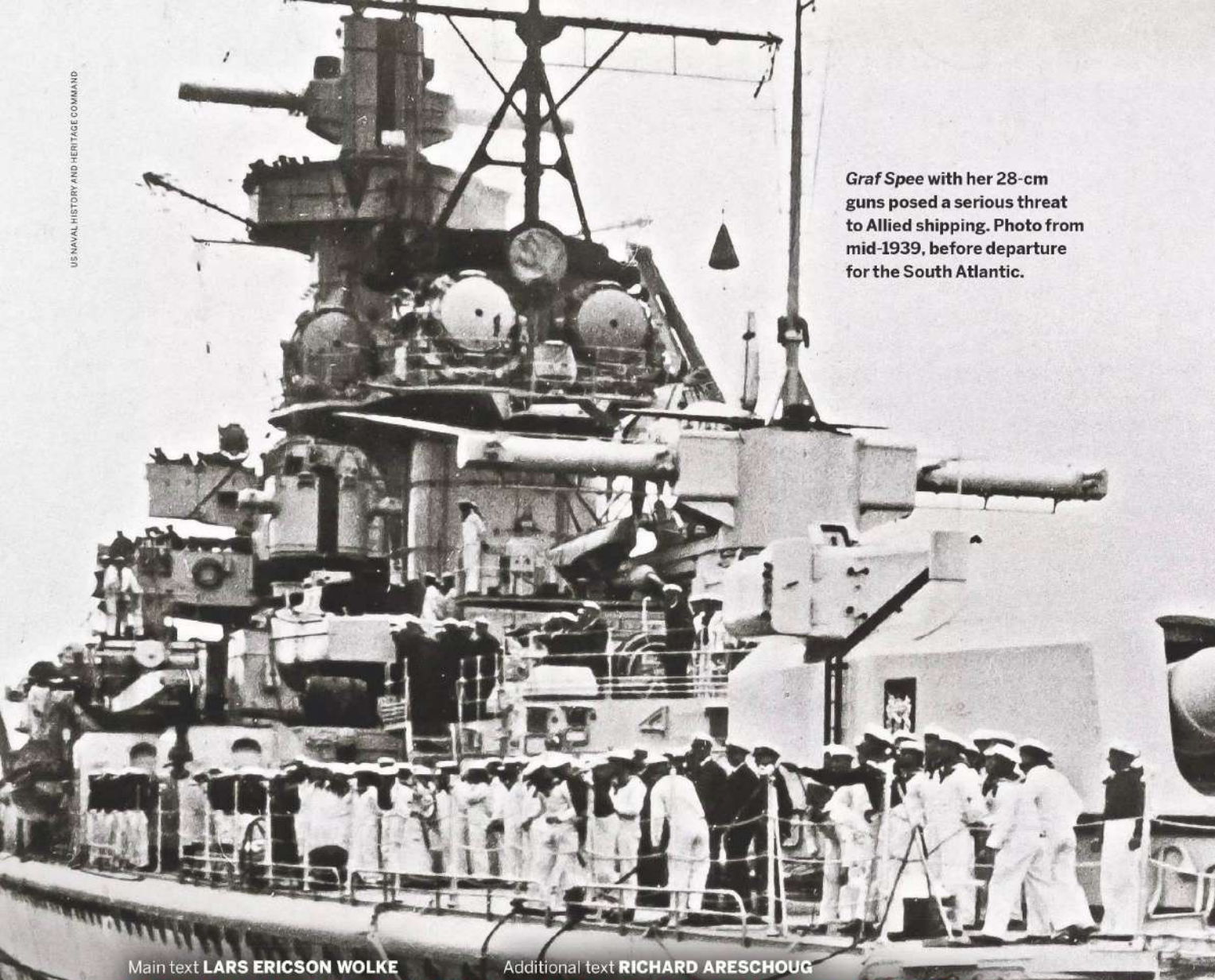
THUS, FROM MARCH to May 1943, something drastic happened. The sinking of merchant ships fell by two thirds, while U-boat losses soared to an unacceptable level for the Germans. They doubled and reached a record of 41 submarines lost in May. The reasons for this turnaround and its subsequent continuance are many:

- Increased number of modern escort vessels
- The escort carriers
- Better airborne radar
- Increased ability to intercept and exploit German radio traffic.
- Better ship-borne radar
- Increased radio tracking also from ships
- Increased number of long-range land-based anti-submarine aircraft
- Combating submarines en route to and from bases in France

ALTHOUGH IT IS now clear that the battle had been won by the Allies, they could take nothing for granted. While Admiral Dönitz withdrew his submarines for reorganisation, the US and British build-up of anti-submarine capability continued on a number of fronts. It soon turned the U-boats into hunted animals, still feared, but for the rest of the war, doing little more than sinking about one merchant ship for every submarine lost. There had been a time when the ratio was 30-50 ships per sub sunk. In spring 1943, the ratio dropped to a level at which it had never been before, except temporarily, and would not rise again for the rest of the war.

In the last two years of the war, Allied convoys crossed the Atlantic and adjacent waters with relatively low losses. The 272 merchant ships sunk were offset by the production of around 2,200 new boats. The price the German submarines had to pay for fighting to the last against hopeless odds was another 370 U-boats lost (out of a total of around 780 throughout the war). It's no wonder that 70 per cent of all those who served in the Kriegsmarine's submarines were killed.

Johan Lupander is a military history writer and author.



US NAVAL HISTORY AND HERITAGE COMMAND

Graf Spee with her 28-cm guns posed a serious threat to Allied shipping. Photo from mid-1939, before departure for the South Atlantic.

Main text **LARS ERICSON WOLKE** Additional text **RICHARD ARESCHOUG**

HUNT FOR THE DREADED GRAF SPEE

When the Treaty of Versailles banned Germany from building large battleships, Hitler's response was the smaller but heavily armed 'pocket battleship'. In autumn 1939, *Graf Spee* spread terror in the South Atlantic and was chased across the seas.

When World War II naval conflicts are mentioned, most people think of the ruthless submarine warfare in the North Atlantic, the hunt for the largest German warships, such as *Bismarck* and *Tirpitz,* or the great battles in the Pacific. But the war at sea started a long way from European and North American waters.

From the outbreak of war in September 1939 to the beginning of May 1940, the British, French and German armies stood and watched each other along the Franco-German border without any real fighting breaking out. However, everything would change with the major German offensive in the west, which started on 10th May 1940. Just six weeks later, it led to the fall of France and the evacuation of the British Army from the continent.

But in autumn 1939, this was still some way off. In early October, struggling Poland surrendered to the German and Soviet armies, and the guns temporarily fell silent even in Eastern Europe.

If the land warfare was characterised by calm, the situation was the polar opposite in the North ▶



Germans defied peace treaty

★ *Admiral Graf Spee* entered service on 6th January 1936 as one of three Deutschland-class ships. The class had been planned in 1920 and was a consequence of the limitations of the Versailles Treaty. Under this, Germany was only allowed to keep eight obsolete battleships built between 1902 and 1906, and they could only be replaced when 20 years old. Also, new builds could not have a displacement of more than 10,000 tonnes.

The German naval leadership under the Weimar Republic was forced to rethink. Two ship types were proposed: a monitor-like coastal defence ship and a lighter armoured, fast cruiser-like ship. The second was chosen, albeit with heavier armour.

To ensure the availability of suitable artillery, the 28-cm calibre was chosen, although 30.5-cm was allowed. Officially, the displacement limit of the peace treaty and of the Washington Treaty was respected. In fact, the maximum displacement of the three ships was between 14,290 and 16,020 tonnes, a fact that only became known after World War II.



***Deutschland* was the first of three ships in the same class.**

HISTORIE ARCHIVE

The ships were mainly built for a trade war against arch-enemy France, but the British also saw them as a major threat.

► Atlantic and North Sea, where thousands of people were fighting and dying. The German U-boat campaign against shipping to the British Isles had begun and by the end of 1939, 114 Allied merchant ships had been sunk, 37 of them in the Atlantic and North Sea. Only one German submarine had been torpedoed, but a further eight had been lost to mines or depth charges, and at least 33 Allied ships had been sunk by mines laid by the Germans.

AT THE BEGINNING of the war, it was not only submarines that posed a threat to Allied shipping. The bigger German surface vessels – battleships and cruisers – were also capable of inflicting heavy losses on Allied merchant ships. Therefore, these German ships were often hunted down by Allied naval forces, who tried to sink them before they could reach the large convoys and start spreading death and destruction among merchant ships.



HISTORIE ARCHIVE

***Graf Spee* was named after Admiral Maximilian von Spee who won the naval battle of Coronel, but was killed in the Falklands in 1914.**

One of these German warships was the cruiser *Admiral Graf Spee*. On the very day that France and Britain declared war on Germany, 3rd September 1939, she headed south and quickly reached her intended area of operation in the South Atlantic.

Graf Spee was accompanied by the supply ship *Altmark*. Aboard *Graf Spee*, her commander, Captain Hans Langsdorff, did everything he could to confuse British and French reconnaissance aircraft. He painted over the ship's name on the stern and replaced it with the name of one of her sister ships, *Admiral Scheer*. In addition, he erected a dummy gun turret on the bridge to change the ship's silhouette. Another deceptive move was to switch between the British and French flags.

THE FIRST VICTIM of *Graf Spee* was the British cargo ship *Clement*, which was sunk off Pernambuco in north-eastern Brazil on 30th September 1939. When the crew was picked up by another ship, they reported that they had been attacked by the *Admiral Scheer*.

The hunt was on. A lone but powerful German ship wreaking havoc in the South Atlantic could cause tremendous damage to Allied shipping just by the latent threat it posed. In the mid-Atlantic, British naval commanders organised four battle groups for the hunt. They consisted of one aircraft carrier, two battleships and two cruisers from the Royal Navy, and another aircraft carrier and five cruisers from the French Navy.

On top of that, three battle groups were formed in the South Atlantic with one aircraft carrier, one battleship and six cruisers. As if that weren't enough, one aircraft carrier and two cruisers were assigned to scout the southern Indian Ocean. In addition to these ships, the aircraft carrier *Glorious* and the battleship *Malaya* were ordered to reinforce the area, along with several destroyers.

Vast expanses of sea had to be scoured and superior firepower would be required if the German ship was encountered. But the British and French effort proved that *Graf Spee* had already succeeded in one of her aims, namely to attract such large numbers of pursuers that the British and French naval forces around Britain and in the Mediterranean were considerably weakened.

ON SEVERAL OCCASIONS the British missed *Graf Spee's* position, but then, on 10th October 1939, a French-flagged ship approached the British ship *Huntsman*. The commander, Captain Brown, thought he recognised the French battleship *Dunkerque*, but it was a fatal mistake. German sailors boarded the *Huntsman* and seized important information about trade routes in the South Atlantic. Before sinking the ship, they sent out fake distress

calls, giving a false position and stating that the *Huntsman* had been torpedoed.

The British now began to suspect (wrongly) that at least two German surface ships were operating in the South Atlantic, and when *Graf Spee* sank the steamer *Trevanion* on 22nd October, their suspicions were strengthened.

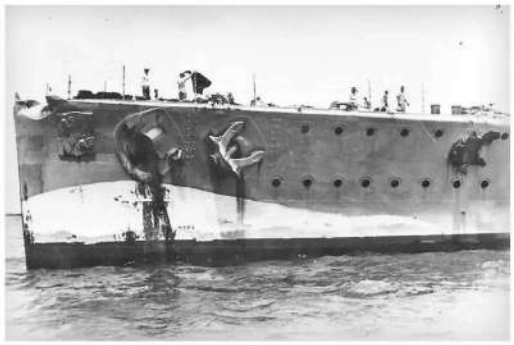
After the attack, *Graf Spee* went around the Cape of Good Hope and temporarily hid in the Indian Ocean. British merchant ships were ordered to send a distress signal as soon as they feared an attack by enemy warships. In her new area of operation, the *Graf Spee* sank the tanker *Africa Shell* off the Mozambique Channel on 15th November, before returning to the South Atlantic four days later.

ON HIS RETURN, Langsdorff further confused his opponent; he had a top made for the extra 'gun turret', with 28-centimetre guns, and a funnel, all in wood. A false bow wave was also painted on the hull to give the impression that the ship was travelling faster than it really was. This led to a mix-up with the British battlecruiser *Renown*. Adding to the difficulties, the ship was labelled *Graf Spee* on one side and *Deutschland* – the name of *Graf Spee's* other sister ship – on the other.

ON 2ND DECEMBER, *Graf Spee* attacked a British ship, *Doric Star,* off Walvis Bay in Namibia, and a distress call was picked up by a steamer off Saint Helena. The following day, a British cargo ship, the *Tairoa,* sank after being attacked by *Graf Spee*. From the British naval base at Port Stanley in the Falkland Islands, ships were sent into Argentine and Brazilian waters, believing they were chasing the *Admiral Scheer*. On 7th December, the British cargo ship *Streonshalh* was sunk. This sinking was the culmination of German activities in the South Atlantic. Captain Langsdorff now chose to head for the mouth of the River Plate, also known as Río de la Plata, giving the British the impression that he intended to round Cape Horn and head into the Pacific. His real intention was to sail home to Germany and a much-needed shipyard refit.

Finally, at 06.08 on the morning of 13th December, Commander Sir Henry Harwood on board his flagship, the cruiser *Ajax,* could see smoke on the horizon. At 06.14, the battle began.

Three British cruisers – *Exeter, Ajax* and *Achilles* – now attacked *Graf Spee* in the mouth of the River Plate. The German artillery was initially more



HISTORIC ARCHIVE

The false bow wave that Langsdorff had painted on *Graf Spee*.

effective than the British, mainly due to the use of radar to assess the distance of the ship's guns. During the battle, *Graf Spee* deployed several smoke screens to make things difficult for the British.

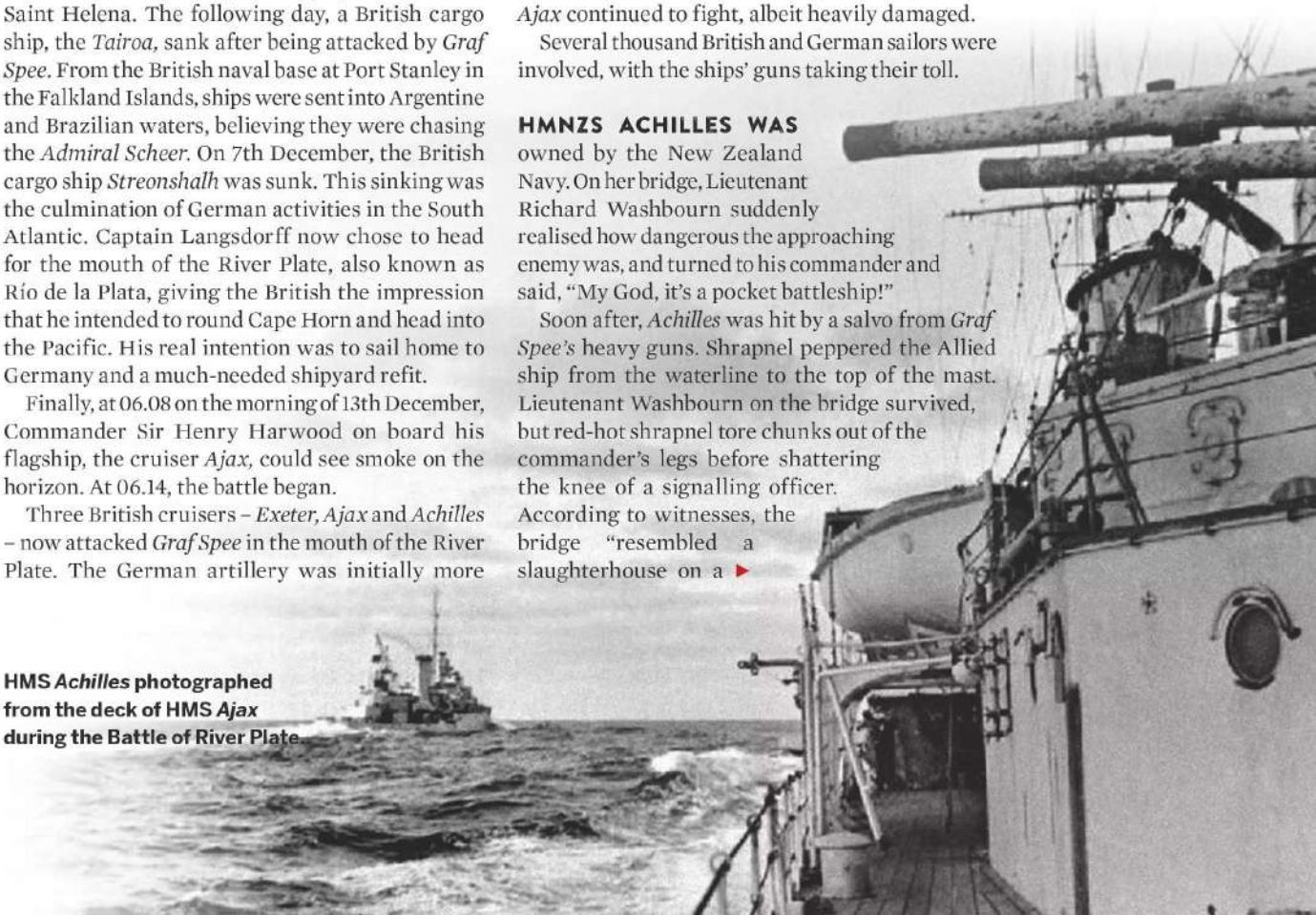
The heavy German naval artillery hammered at the British cruisers, which struggled to achieve the same effect with their lighter guns. An officer on an increasingly damaged *Exeter* exclaimed in frustration: "We might just as well be bombarding her with a lot of bloody snowballs."

Despite suffering severe damage early on, *Exeter* continued to fire on *Graf Spee,* eventually scoring a direct hit on the German ship. However, *Graf Spee* hit back, both against *Exeter* and *Ajax*. *Exeter* was eventually taken out of the battle, while *Achilles* and *Ajax* continued to fight, albeit heavily damaged.

Several thousand British and German sailors were involved, with the ships' guns taking their toll.

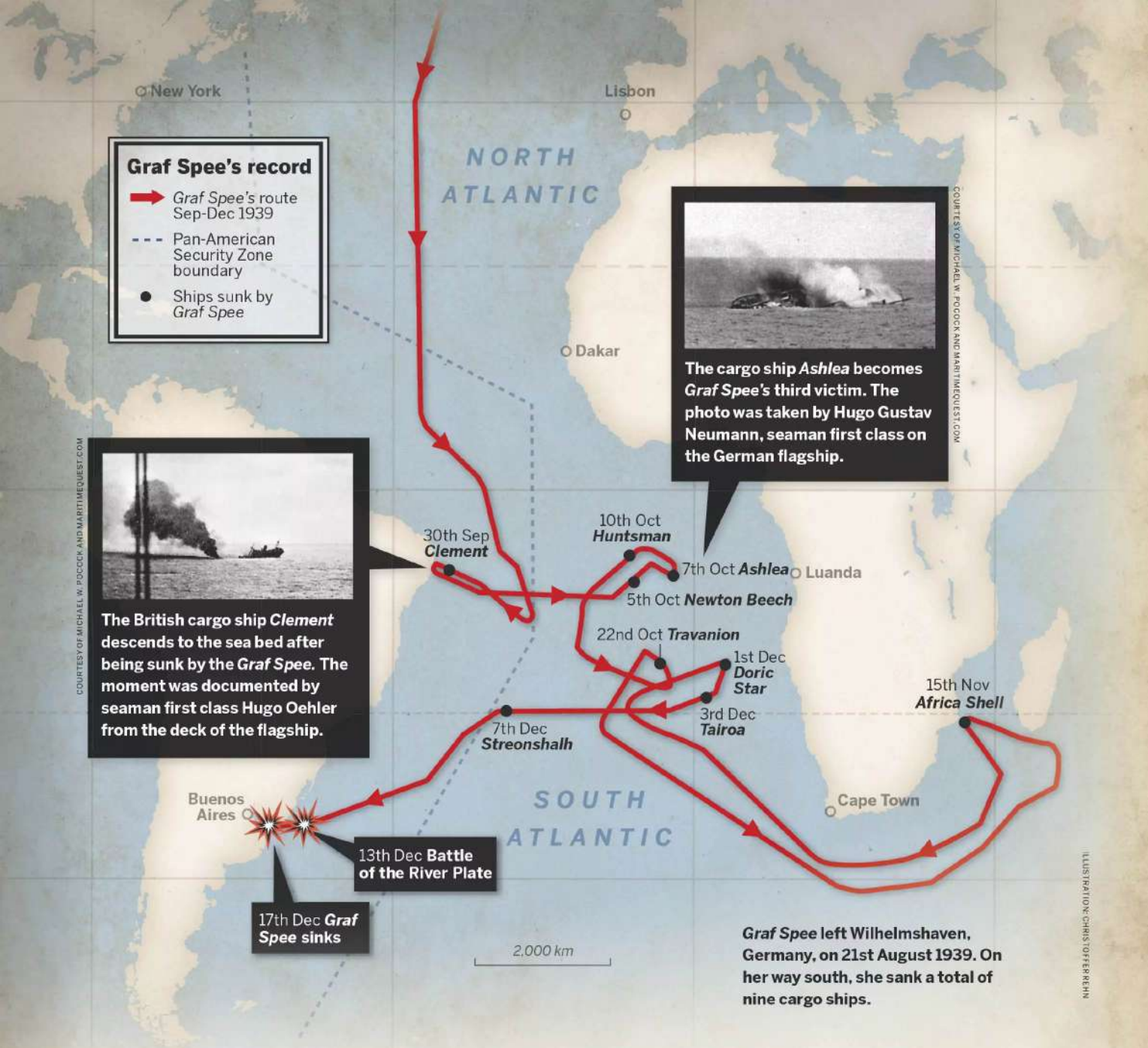
HMNZS ACHILLES WAS owned by the New Zealand Navy. On her bridge, Lieutenant Richard Washbourn suddenly realised how dangerous the approaching enemy was, and turned to his commander and said, "My God, it's a pocket battleship!"

Soon after, *Achilles* was hit by a salvo from *Graf Spee's* heavy guns. Shrapnel peppered the Allied ship from the waterline to the top of the mast. Lieutenant Washbourn on the bridge survived, but red-hot shrapnel tore chunks out of the commander's legs before shattering the knee of a signalling officer. According to witnesses, the bridge "resembled a slaughterhouse on a ▶



IMPERIAL WAR MUSEUM

HMS *Achilles* photographed from the deck of HMS *Ajax* during the Battle of River Plate.



First with ground-breaking radar

★ The first marine radar was a civilian French model fitted to the passenger ship *Normandie* to detect icebergs.

Germany's military radar development began in earnest in 1933, and by 1936 the company GEMA had developed Seetakt, the world's first marine fire-control radar. The antenna was fixed and mounted on the main rangefinder. In order to turn it, the entire rangefinder had to be rotated. The first warship in the world to be equipped with radar was *Graf Spee*, in 1936. An improved version of Seetakt, FuMo 22, was introduced in 1939 and *Graf Spee* sported this type when she was sunk. The early radar was sensitive to moisture and vibrations when firing. The antenna could also be damaged by movement in rough seas.

The British were not far behind in their development and had a test facility for a naval fire-control radar ready in December 1939. The first was installed on the battleship *Nelson* in June 1940.

When *Graf Spee* herself was sunk, British naval intelligence personnel were soon on board to study the radar in order to develop countermeasures. Personnel from the American light cruiser *Helena* also came aboard the wreck in early 1940 to inspect the radar.






HISTORIE ARCHIVE

The map shows how *Graf Spee* and the Allied ships manoeuvred during the battle on 13th December 1939. Above is Hans Langsdorff.

▶ particularly busy day", with one dead and several seriously injured officers and sailors.

Despite the Allied losses, the Germans had no chance to strike out into the Atlantic and Langsdorff chose to withdraw. *Graf Spee* sought refuge in the port of Montevideo, where under international law she was allowed to stay for 72 hours. The British tried their best to keep the dreaded warship trapped in the Uruguayan harbour, but their resources were too stretched.

On the night of 13th-14th December, *Graf Spee* was anchored off the shore of Uruguay's capital Montevideo while Allied ships waited further out to sea. Now Langsdorff did something very strange from a British point of view: instead of trying to break through the thin British lines, he kept his ship close to the Uruguayan harbour. Langsdorff was able to obtain an extension from the harbour authorities, which was welcomed by the British, as it gave them time to strengthen their forces.

The British succeeded in delaying the departure of *Graf Spee* in various ways, including allowing their merchant ships in Montevideo harbour to sail one by one, thus delaying the departure of the German pocket battleship by 12 hours each time, in accordance with international law.

ON 17TH DECEMBER, Langsdorff telegraphed Berlin. He wanted to attempt an escape. The reply from Berlin was clear: both Hitler and Erich Raeder, head of the navy, supported the initiative, but if it failed, *Graf Spee* would be scuttled. At this point, Langsdorff's artillery officer confused the three waiting British cruisers for much more powerful ships – the aircraft carrier *Ark Royal*, the battleship *Renown* and some destroyers – a fatal mistake. An attempt to break out was therefore never made.

Instead, preparations were made to sink *Graf Spee*, and only about 40 men were kept on board. The rest were taken on to the German cargo ship *Tacoma*.

At 19.52 on 17th December, Langsdorff steered *Graf Spee* towards the blockade at the mouth of the River Plate. There she was blown up by her own crew. As Allied ships approached the harbour, *Graf Spee* was already a burning wreck. On board, the British found a strange antenna: a state-of-the-art radar system.

THREE DAYS LATER, the naval drama had its drastic epilogue. In a hotel room in Buenos Aires, Captain Langsdorff chose to end his life with a shot to the head. When he was found, he was in uniform and lying on the German naval flag – according to unconfirmed reports, it was the imperial flag and not the Nazi flag. In a farewell letter, Langsdorff took full responsibility for the sinking of his ship and declared himself happy to atone with his life: "I shall face my fate with firm faith in the cause and the future of the nation and of my Führer."

For Germany, the battle was not only a military defeat – above all, it was a propaganda disaster. For the British, it was a corresponding triumph.

Lars Ericson Wolke is a professor of military history at the Swedish Defence University and an author. **Richard Areschoug** is a military history writer.

GRAF SPEE



US NAVAL HISTORICAL CENTER PHOTOGRAPH

The *Admiral Graf Spee* was designed to take out any cruiser fast enough to catch up with the pocket battleship. The ship was heavily armed for her size.

Secondary armament
Eight 15-cm L/55 C/28 rapid-fire guns in a single turret.

Rangefinder
10.5-cm main rangefinder.

Heavy anti-aircraft guns
Six 10.5-cm L/65 C/33 guns in three twin turrets.

Fire-control radar
FuMG 39(gO).

Armoured control tower
Ship was controlled from here, which is where fire-control radar and main rangefinder were.

Lights
Four of them.

Reserve rangefinder

Fake bow wave
Gave impression that ship was travelling at high speed.

HISTORIE ARCHIVE



Main forward magazine
Maximum of 720 shells for the 28-cm guns. Charges and projectiles were stored separately.

Power plant with turbines

Exhaust pipe
From engines to funnel.

Main armament Front triple turret with 28-cm L/52 C/28 guns. Had a range of over 30 kilometres.

Small boats
Eight lifeboats and motor launches.

HISTORIE ARCHIVE



Engines Consisted of four pairs of double-acting MAN diesels totalling 54,000 hp. They were very reliable and gave a range of 8,900 nautical miles at 20 knots. Maximum speed was 28.5 knots.

The crew August 1939

Total 1,055 men

39 officers

1 captain

47 suboffers

950 other personnel divided into ten divisions



HISTORIE-ARCHIVE

Aircraft catapult Originally a Heinkel He 60 was used, but was later replaced by an Arado Ar 196 reconnaissance plane (pictured). The photo taken is from the cruiser *Admiral Hipper*.

FACTS ABOUT THE SHIP

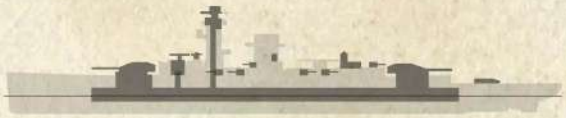
Type: Pocket battleship.
Class: Deutschland.
Laid down: 1st October 1932.
Launched: 30th June 1934.
In service: 6th January 1936 until 17th December 1939.
Displacement: 12,000-16,200 tonnes.
Length: 186 metres.
Width: 21.6 metres.
Draught: 7.4 metres.
Speed: 28.5 knots.
Range: 8,900 nautical miles at 20 knots.
Engines: Eight nine-cylinder double-acting MAN diesels, two propellers (40,770kW).
Crew: Maximum 1,150 men.
Armament: 6x 28-cm guns, 8x 15-cm, 6x 10.5-cm, 8x 37-mm anti-aircraft, 8x 20-mm AA, 8x 533-mm torpedo tubes.
Aircraft: Two Arado Ar 196 seaplanes, one catapult.

Crane Two cranes to lift planes when they landed on the water.

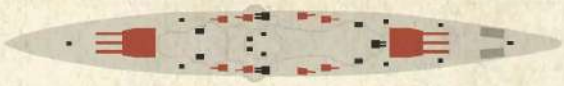
Reserve rangefinder

Main armament Triple turret with 28-cm L/52 C/28 guns. Had a range of over 30 kilometres.

Light anti-aircraft guns Eight 3.7-cm L/83 C/30 guns in two rows.



Areas reinforced with thicker armour.



Position of the weapons as seen from above.
Guns Anti-aircraft Torpedo tubes

Light anti-aircraft guns Twelve 2-cm L/65 guns in a single row.

Torpedo tubes Two rotatable, armoured quadruple 53.3 cm torpedo tubes.

ILLUSTRATION: CHRISTOFFER REHN

Aft main magazine Maximum of 720 shells for the 28-cm guns. Charges and projectiles were stored separately.

Waterline

19 civil employees

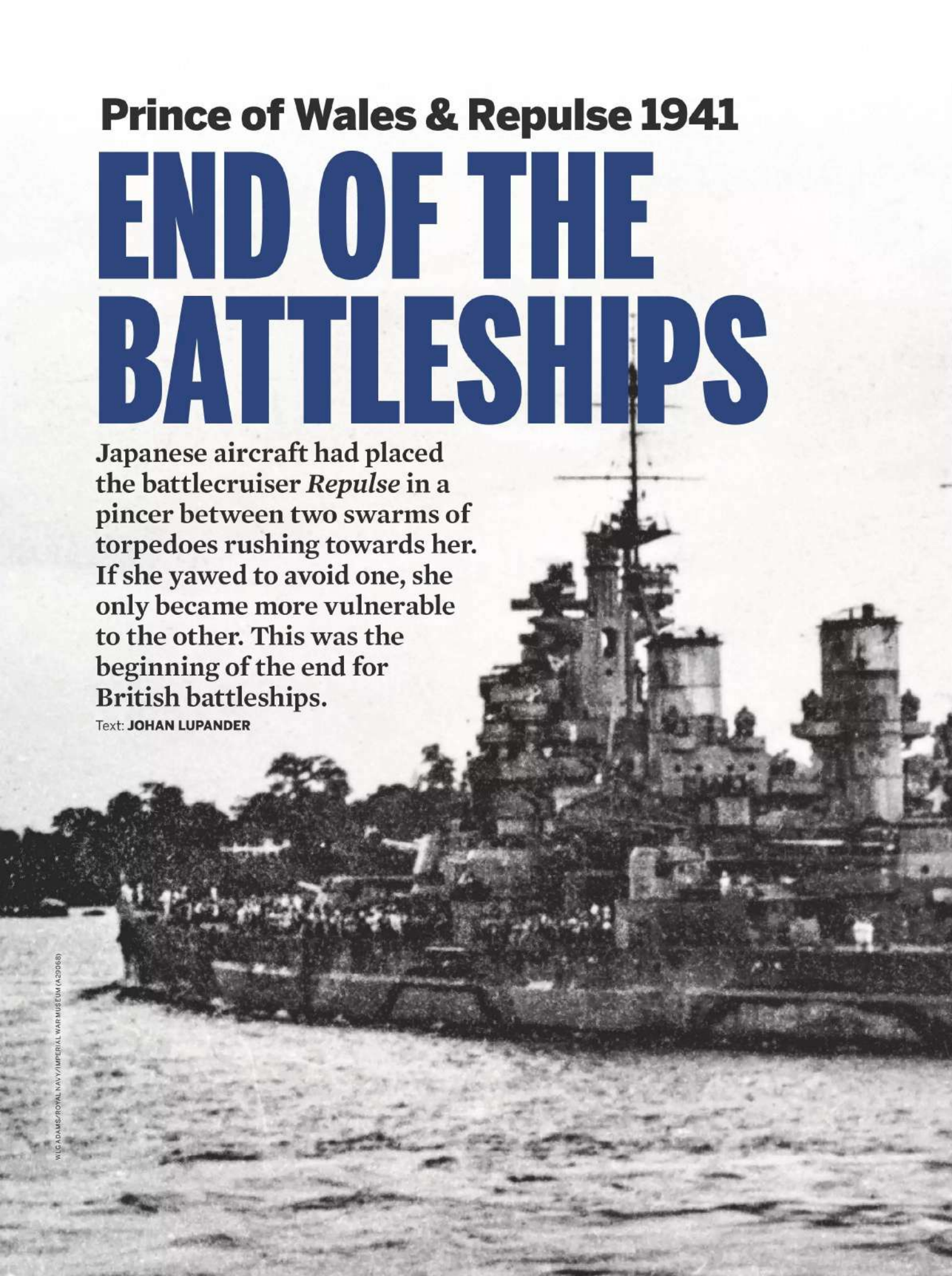
3 hairdressers, 3 cooks, 3 tailors, 3 cobblers, 7 waiters

Prince of Wales & Repulse 1941

END OF THE BATTLESHIPS

Japanese aircraft had placed the battlecruiser *Repulse* in a pincer between two swarms of torpedoes rushing towards her. If she yawed to avoid one, she only became more vulnerable to the other. This was the beginning of the end for British battleships.

Text: **JOHAN LUPANDER**



WLG ADAMS/ROYAL NAVY/IMPERIAL WAR MUSEUM (A 20968)



US NATIONAL ARCHIVES

Japanese torpedo bombers Mitsubishi G4M1 (Betty) attack HMS *Repulse* on the left and HMS *Prince of Wales* on the right. Painting by Nakamura Kanichi, 1942.

HMS *Prince of Wales* leaves Singapore on the evening of 8th December 1941. As well as the battleship, Force Z consisted of a battlecruiser and four destroyers.

In the early 1930s, Britain embarked on a major effort to establish a naval base in Singapore at the southern tip of the Malay Peninsula to counter the growing threat from Japan. However, there was a severe shortage of warships to meet all of Britain's naval commitments around the world. When World War II broke out in September 1939, the Royal Navy's resources were concentrated in Europe. What remained for the Far East were only a few cruisers and destroyers, mostly older vessels.



BASSANO LTD

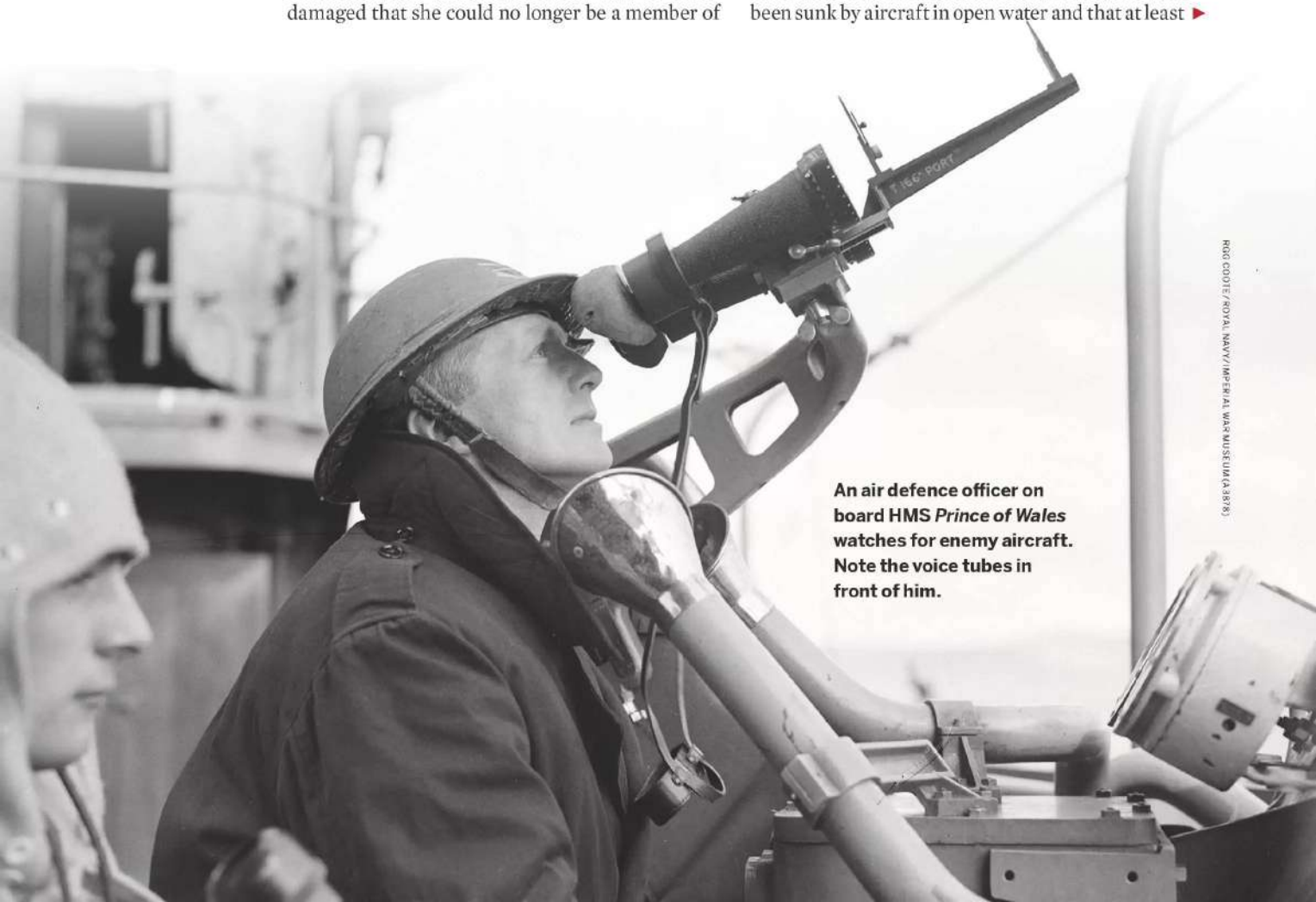
Admiral Tom Phillips.

IN AUTUMN 1940, the threat to Singapore increased with the occupation of French Indochina (now Vietnam, Laos and Cambodia) by Japanese forces. After much deliberation, it was decided in the autumn of 1941 that the naval build-up in the area would take the form of a dedicated operations group – Force G (later known as Force Z) – consisting of the modern battleship *Prince of Wales*, the older battlecruiser *Repulse* and the brand-new aircraft carrier *Indomitable*. The main aim was to deter Japan from starting a war in the first place.

However, on 3rd November, the aircraft carrier, which was off the coast of Jamaica for crew familiarisation, struck a reef and was so badly damaged that she could no longer be a member of G Force. Despite the loss, the British War Cabinet decided that the bulk of the force would proceed to the Far East as planned.

"ADMIRAL PHILLIPS ASSESSED THE THREAT ON THE BASIS THAT NO BATTLESHIP HAD BEEN SUNK BY AIRCRAFT IN OPEN WATER"

ON 8TH DECEMBER 1941, Force G assembled in Singapore, comprising the two battleships along with a combined escort of four almost obsolete destroyers. Although the artillery capability of the ships was undoubtedly good, their protection against aircraft was somewhat more questionable. However, most of the Royal Navy's senior commanders – not least the head of G Force, Admiral Tom Phillips – assessed the aerial threat on the basis that no battleship had yet been sunk by aircraft in open water and that at least ▶



RGG CODE / ROYAL NAVY / IMPERIAL WAR MUSEUM (A 3878)

An air defence officer on board HMS *Prince of Wales* watches for enemy aircraft. Note the voice tubes in front of him.

Prince of Wales's deficient air defences

By December 1941, HMS *Prince of Wales*, the Royal Navy's newest battleship, was in service and had already become famous for her action against the German *Bismarck* in May that year. She represented the best that British shipbuilding could achieve.



RCG COOTE/ROYAL NAVY/IMPERIAL WAR MUSEUM (A3904)

Two eight-barrelled 40-mm anti-aircraft machine guns and one of the turrets with two 13-cm general-purpose guns.

★ In the coming battle, *Prince of Wales's* (and *Repulse's)* anti-aircraft defences would play a crucial role. When evaluating them, a number of facts should be borne in mind. Firing at aircraft from ships was – and is – the most difficult artillery problem imaginable. From a moving platform – the ship – you have to hit another (three-dimensionally) moving target – the aircraft. The problem is complicated by the fact that the ship can pitch and roll, and the aircraft can change course and altitude in a matter of seconds.

Despite recent technological advances, the problems have still not been overcome except at short ranges, where success rates are good. At longer ranges, anti-aircraft missiles are used.

PRINCE OF WALES was equipped with what was considered to be the most sophisticated long-range air defence system in naval warfare. It consisted of eight twin turrets with 13-cm general-purpose guns that could be controlled by no fewer than four separate anti-aircraft fire-control systems. They had also been modified with radar rangefinders. These were the heaviest all-purpose guns in the Royal Navy, but the requirement to combat both surface and air targets had led to technical solutions that would prove less than ideal.

The intention was that the 13-cm gun would be a good compromise between the shell weight of the light cruiser's 15-cm naval artillery and the rate of fire of the existing types of 10-cm general-purpose pieces. However, in order to fit the intended ships, the gun turrets had to be made too narrow, making it difficult to operate the guns and halving their rate of fire to six to eight rounds per minute when many more shells in the air were needed against aerial targets (10-cm guns could handle 15-20 rounds per minute). The shell weight was just over half that of the 15-cm shell, which reduced its armour penetration and thus its usefulness against naval targets.

The shortcomings on the gun side were matched by problems with the anti-aircraft fire-control system, which was also only understood by a limited number of experts. The system had been improving since the early 1930s and had reached the point where aircraft approaching on a straight course and at a constant altitude and speed could be fought with a probability of success that was not largely due to chance. The great practical difficulty was that these basic conditions were at best met only by bombers in level flight. Against fast-flying targets at varying speeds, courses or altitudes, the system was useless.

A FUNDAMENTAL weakness of the whole fire-control system was that the shell detonated either on a direct hit (unlikely) or some time after firing by means of a small clockwork device when the target and shell were estimated to be close together. Setting the device was done just before loading the shell, when the central instrument's calculation of the required time delay was transferred to the movement. It then took several seconds for the shell to be loaded and fired, during which time the setting became obsolete. This had to be compensated for with adjustments. The problem was only solved a few years later with the introduction of the fuse.

IN VIEW of these fundamental problems, it's not surprising that the choice was often made to fire a barrage instead – in other words, to fill an area in the air that the planes were expected to pass through with the greatest possible number of detonating shells.

Even the medium-range anti-aircraft defence system on *Prince of Wales* had problems – which were revealed too late. It consisted of four eight-barrelled guns with the Vickers 2-pound (40-mm) anti-aircraft automatic gun, a favourite subject for newsreel makers with its barrel recoil. Unfortunately, the gun had a low muzzle velocity, inadequate ammunition and insufficient rate of fire. A single 40-mm Bofors gun had been installed on the aft deck.

Finally, the short-range air defence consisted of 20-mm anti-aircraft automatic guns and 12.7-mm machine guns, whose practical range – especially for the machine gun – was very short.

► *Prince of Wales*'s anti-aircraft defences were of a high standard.

The war between Japan and Britain broke out on 8th December 1941, coinciding with the Japanese attack on the US naval base Pearl Harbor (dated 7th December because of the different time zones). The Japanese attacked multiple targets and landed on the east coast of the Gulf of Thailand, within easy reach of the Japanese air bases off Saigon and the ultimate target of the attack, Singapore. Thus Britain's – somewhat optimistic – idea of deterrence had collapsed, but engaging an invasion fleet was precisely what Force G was designed to do. Japanese command knew of the force's existence and had taken steps to protect its operations. Two days before the outbreak of war, they had already laid a field of a thousand mines and established two submarine reconnaissance lines.

IN VARIOUS WAYS, the British leadership in Singapore had a good idea of the Japanese military resources in the area. The approaching invasion fleet had been spotted a few days earlier. However, the threat was not really taken seriously, as the whole Western attitude to Japanese military capability had long been a patronising one, to say the least. This included a serious underestimation of bomber and torpedo aircraft capabilities, including the planes' range. The speed and scale of the entire Japanese offensive also came as a surprise.

The first Japanese landing on the east coast of the Malay Peninsula took place on the night of 8th December (actually 45 minutes before the attack on Pearl Harbor) and was immediately reported to British command in Singapore. Together with Admiral Phillips and his staff, a Force G company was organised to attack Japanese targets – a landing fleet in particular – in the Gulf of Thailand. Phillips requested reconnaissance and fighter protection from the Royal Air Force, but was told that hostile air base operations, as well as the lack of modernity and numbers of the British aircraft fleet, made it difficult to meet his requirements.

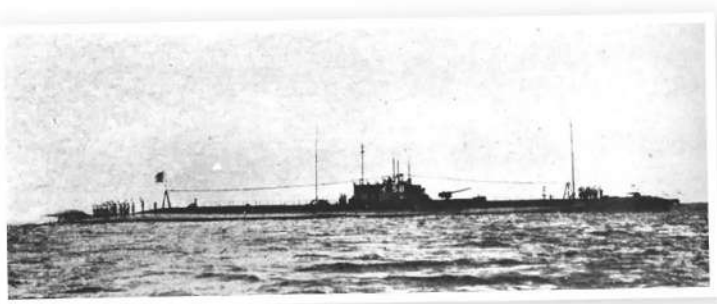
FORCE G – now known as Force Z – sailed in the evening of 8th December and, thanks to the darkness of the night and bad weather, managed to remain undetected until the afternoon of the following day. At that point, a Japanese submarine sighted the force and reported its position, course and speed. The report was greatly delayed, but still led to a flurry of Japanese activity with reconnaissance flights. A strike force of bombers also took off, although only a few hours of daylight remained. Confusion reigned as night fell, and the Japanese only narrowly avoided attacking their own cruiser force after illuminating it with flares. At the time, the distance between the cruisers and Force Z was only eight kilometres, and the light was spotted by a British destroyer.

"THE JAPANESE MANAGED TO VERIFY FORCE Z'S POSITION AND COURSE"

The Japanese managed to verify Force Z's position and course before wisely recalling their aircraft to prepare for fresh daylight operations. On board *Prince of Wales*, Admiral Phillips correctly concluded that the element of surprise had been lost and that the Japanese invasion fleet would now be dispersed and become too elusive a target. He therefore decided to cancel the whole operation and at 20.55 ordered a change of course to the south – which in the darkness was completely missed by the Japanese.

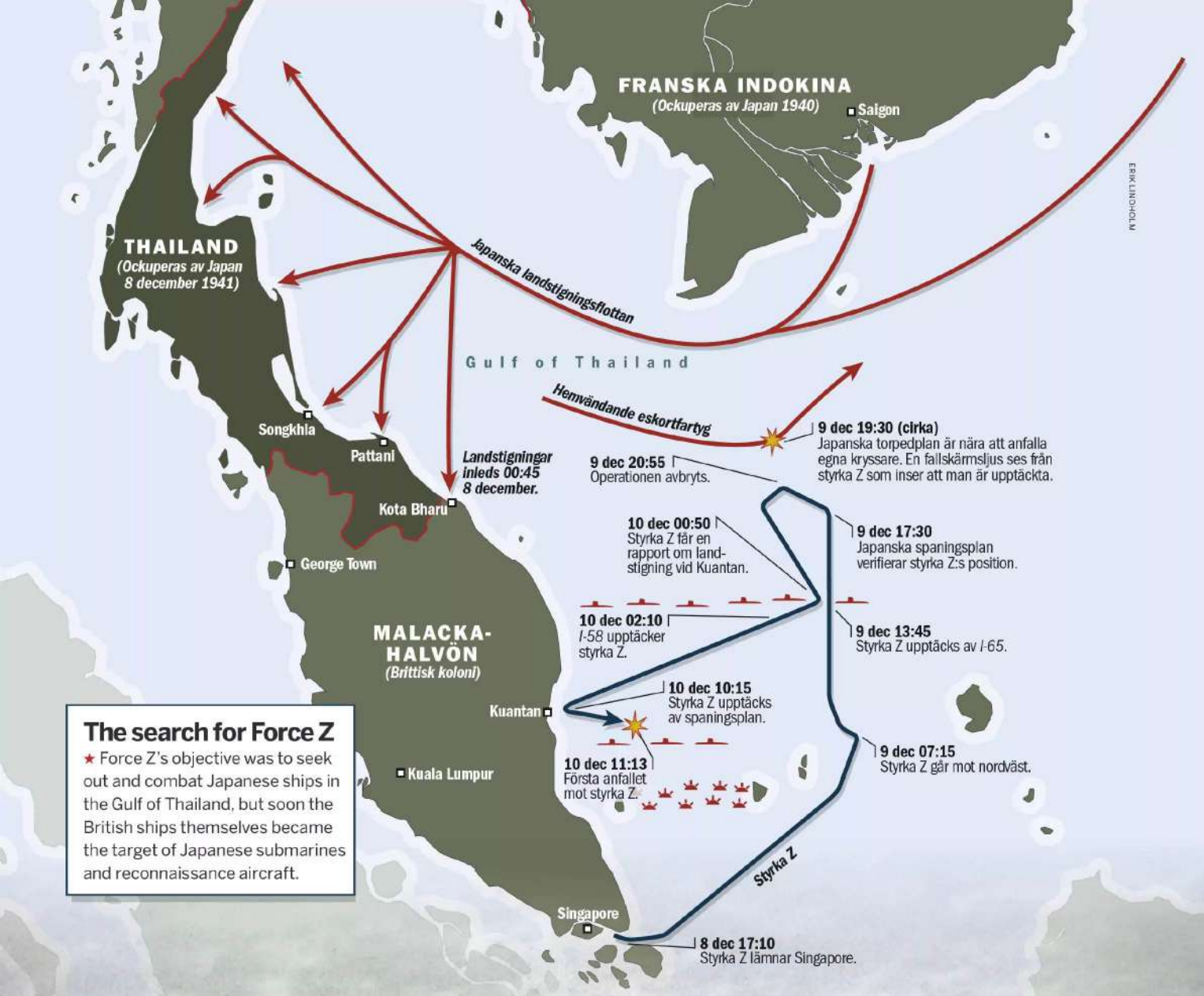
ON THE NIGHT of 10th December, one of those common wartime misunderstandings occurred that would have fatal consequences for Force Z. The small town of Kuantan on the east coast of the Malay Peninsula, 290 kilometres from Singapore, was being defended by a poorly trained Indian infantry brigade. During the evening and night, it had thought to have been subject to a Japanese landing attempt, which was repulsed by heavy fire. When Admiral Phillips received information about this unconfirmed event around midnight, he saw an opportunity to give at least some meaning to Force Z's operation and ordered a change of direction to the south-west, towards Kuantan. There was still complete radio silence, which meant that Singapore had only a very vague idea of Force Z's position and Admiral Phillips's intentions.

Meanwhile, the Japanese submarine *I-58* sighted Force Z at midnight and launched an unsuccessful attack. In the following hours, it managed to shadow the British battleships on the surface and noted the change of course to the south-west. The ►



THE NAVY ASSOCIATION OF JAPAN

The Japanese sub *I-58* shadowed Force Z.



ERIK LINDHOLM

The search for Force Z

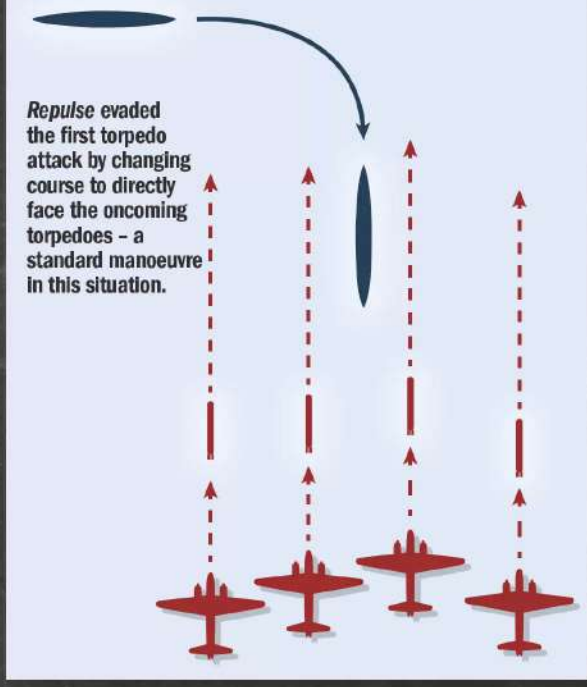
★ Force Z's objective was to seek out and combat Japanese ships in the Gulf of Thailand, but soon the British ships themselves became the target of Japanese submarines and reconnaissance aircraft.



W. G ADAMS/ROYAL NAVY/IMPERIAL WAR MUSEUM (A29069)

HMS *Repulse* departs from Singapore on 8th December. The World War I battlecruiser had been partially modernised during the inter-war years. Her main artillery was of a high standard, while the anti-aircraft armament was inadequate, with six 10.2-cm guns and two eight-barrelled two-pounder anti-aircraft machine guns.

Repulse avoids the torpedoes...

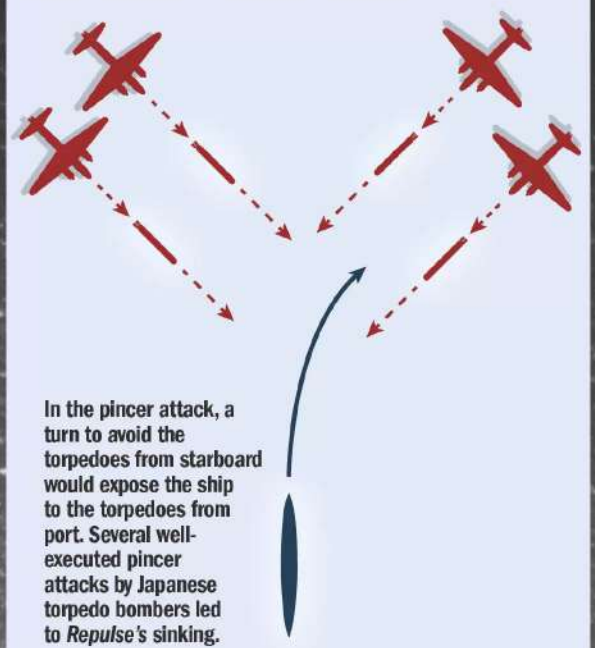


Repulse evaded the first torpedo attack by changing course to directly face the oncoming torpedoes – a standard manoeuvre in this situation.

US NAVAL HISTORY AND HERITAGE COMMAND ILLUSTRATION: ERIK LINDHOLM

A Japanese aerial photograph of the first attack. Several water spouts can be seen after shell impact around *Repulse* (bottom), which had just been hit by a bomb.

...but is caught in a pincer



In the pincer attack, a turn to avoid the torpedoes from starboard would expose the ship to the torpedoes from port. Several well-executed pincer attacks by Japanese torpedo bombers led to *Repulse*'s sinking.

observations were signalled by radio, but again the Japanese communications system was so inadequate that only parts of the report reached air force command outside Saigon. However, the information was sufficient to initiate frantic preparations for a new attack attempt at dawn.

EARLY IN THE morning, Force Z glimpsed what was thought to be a Japanese reconnaissance plane, indicating that it had again been spotted. Nevertheless, it spent several hours in the early morning making sure that the waters off Kuantan were clear of Japanese forces, including aerial reconnaissance from its own amphibious aircraft. It was not until after 10.00 that Force Z again headed south-east to return to Singapore. Shortly afterwards, three more Japanese reconnaissance planes were sighted. Now it had definitely been spotted by the enemy.

After Force Z's position was again revealed by *I-58's* reports, the three Japanese bomber flotillas in the Saigon area organised an attack with commendable speed. At their disposal were 68 slightly older Mitsubishi G3M2 torpedo bombers (Allied reporting name: Nell) and 26 modern, fast Mitsubishi G4M1 (Betty) torpedo bombers. The task now was to allocate resources for reconnaissance, bombing and torpedo attacks. Nine planes, with light bomb loads but full fuel tanks, took off at 05.00 to determine the exact position of the enemy. The urgency and uncertainty of the enemy's position meant that 34 planes loaded with bombs and 51 planes each carrying a torpedo took off between 06.30 and 08.00. There was no time to organise a well-prepared, coordinated attack.

From 10.15, Force Z was shadowed by three Japanese reconnaissance planes which, through reports and a homing signal, helped the torpedo bombers to find their way. However, it would still be about an hour before the first strike force arrived on the scene. If the time had been used properly, Force Z would have had a good chance of surviving the impending disaster. A British fighter division was waiting in Singapore to provide air cover for the force. But Admiral Phillips chose to maintain radio silence and did not send a request for support.

IT WAS JUST after 11.00 when the first Japanese bomber squadron of eight planes sighted Force Z. The planes manoeuvred into position and a moment later, once assembled, attacked with bombs that would, among other things, damage the target's anti-aircraft defences and pave the way for the torpedo planes to attack. They approached at a moderate altitude of 3,000 metres.

Every aspect of the Royal Navy's ability to meet the threat from the air was now to be put to the test:

"IT WAS JUST AFTER 11.00 WHEN THE FIRST JAPANESE BOMBER SQUADRON OF EIGHT PLANES SIGHTED FORCE Z"

combat technology, manoeuvring, ship design, fire control and ammunition protection. And in virtually every area, there would be serious shortcomings.

The air defence equipment on *Prince of Wales* monitored the approaching planes and sent directional and temperature data to the gun turrets. This was the kind of attack they knew how to handle. But up on the bridge, the domineering Admiral Phillips intervened and ordered the whole unit to make a turn to make it more difficult for the Japanese bombers. This was a well-established method of dealing with bombing attacks. What the Admiral did not realise was that the fire-control calculators assumed that the ship was on a straight course and the change of direction that the *Prince of Wales* now initiated immediately rendered the carefully calculated measurements fairly useless. As the guns began to roar, the fire-control officers desperately tried to make manual corrections to the system. Given the conditions, they were reasonably successful – five Japanese bombers suffered shrapnel damage, but none were shot down. Despite this, *Prince of Wales's* air defences were unable to disrupt the Japanese bombing of *Repulse* with her thinner armoured deck. The battlecruiser was hit by a 250-kg bomb, which did not, however, cause major damage.



HISTORIC ARCHIVE (2)

Mitsubishi G4M1 (Betty) and Mitsubishi G3M2 (Nell) torpedo bombers took part in the attack on Force Z.

SHORTLY AFTER THE bombing, the *Prince of Wales* recorded a large new air force on its radar. It turned out to consist of 16 torpedo-armed Nell aircraft in two divisions, which began their attack at 11.40. One division – nine aircraft – attacked *Prince of Wales* in three groups. Once synchronised, they swung in towards the port side of the battleship. The ship was unsure how the attack would develop and therefore delayed opening fire.

The Japanese torpedo bombers attacked at twice the speed of their British counterparts. The *Prince*

► *of Wales's* fire-control system could not cope with such a rapid change in distance. Her 13.3-cm guns therefore switched to firing a barrage, which was intended to fill the air where the enemy planes were expected to pass with the greatest possible number of shells. However, the guns' relatively low rate of fire made the barrage too sparse. The battleship's 40-mm so-called pom-pom guns should have provided a relatively good defence against the Japanese torpedo bombers, but when they opened fire, a problem was revealed. The automatic feeding and loading process put such strain on the cartridges that the shell separated from the cartridge case, causing first one and then more barrels of the eight-barrelled guns to fail. Fixing them while the remaining barrels were firing was not easy.

THE RESULT WAS that the Japanese torpedo planes' attack on one of the world's most modern battleships was met only by the fire of machine guns and 20-mm automatic cannons, supported by far too few shots from the 13.3-cm artillery and only spasmodic fire from the pom-pom guns. A single 40-mm Bofors gun worked flawlessly throughout the battle but could not alone influence the outcome. Without hesitation, the planes flew through smoke and tracer fire and dropped their torpedoes at distances ranging from 600 to 1,500 metres. This resulted in the time taken to reach their target being between 30 seconds and just over a minute for the eight torpedoes (one plane had an unfavourable target angle and attacked *Repulse* instead) – not long enough for the evasive manoeuvre the big battleship initiated.

Rightly or wrongly, *Prince of Wales* already had a reputation for being unlucky. This was reinforced when one of the first Japanese torpedoes hit the ship's most vulnerable points: the rudder and propellers. Just six months earlier, a similar aerial torpedo hit had hit the rudder of *Bismarck* and doomed the German battleship. Now a torpedo's 150-kilo charge detonated next to one of *Prince*



UNDERWOOD & UNDERWOOD/IMPERIAL WAR MUSEUMS

of Wales's four propeller shafts, blowing off the propeller and the last shaft-bearing bracket and bending the entire shaft. The propeller had been driven by 25,000 horsepower and, as it disappeared, the warped shaft rushed upwards, breaking the system of seals and shaft bearings, as well as the walls of the shaft tunnel leading to the turbine room some 80 metres further into the ship's hull. Water poured in through the tunnel and its destroyed bulkheads to the turbine room, which quickly began to fill with water. Water started to leak into the neighbouring boiler and generator rooms. One or two further torpedo hits caused moderate damage.

WHILE THE ATTACK on *Prince of Wales* was still in progress, 14 more Japanese bombers and torpedo planes arrived. Both the new planes and one of the first divisions to arrive chose to focus their attacks on *Repulse*. However, she had a couple of aces up her sleeve that *Prince of Wales* lacked. First, *Repulse* had a distinguished commander, skilled in manoeuvring. Secondly, she was slightly smaller, faster and more manoeuvrable. By turning towards the attacking planes just as they were about to drop their torpedoes, the ship avoided being hit (see illustration on page 38). The old rudder machinery was overloaded with repeated reversals from full port to full starboard, but continued to function. About 15 torpedoes were dropped – none hit.

"ONE OF THE FIRST JAPANESE TORPEDOES HIT THE SHIP'S MOSTVULNERABLE POINTS: THERUDDER AND PROPELLERS"

The attacks ended after about 20 minutes. On board *Prince of Wales,* the situation was almost catastrophic as the encroaching water spread and knocked out more and more of the power ►



Photo taken from a Japanese aircraft during the attacks on 10th December 1941. On the left is *Prince of Wales* in front and *Repulse* behind. On the right is a destroyer, either *Electra* or *Express*.

supply. Shortcomings were now revealed not only in the compactness of the battleship but also in the structure of the electrical system and backup procedures. The rudder machinery was knocked out and the power supply for the lateral movement of the anti-aircraft guns and the ammunition feeds was only partially functional. The incoming water had also caused the ship to list, making it difficult to manoeuvre sideways and to lower the guns for firing at low-flying targets. As another boiler room began to fill with water, *Prince of Wales's* speed dropped to 15 knots. *Repulse*, however, had survived the initial attacks with only one bomb hit.

ON BOTH SHIPS, there was now a chance to tend to those killed or wounded by the Japanese torpedo planes' machine gun fire. More ammunition was produced, minor faults were fixed and sandwiches were distributed to those who couldn't leave their stations.

The lull in the fighting also allowed senior officers to take stock of the situation. When the commander of *Repulse* did not receive a reply from *Prince of Wales* when he asked if he could provide some form of assistance, he took a long overdue decision – he broke radio silence and sent a situation report to Singapore at 11.58. The fighter squadron standing by on behalf of Force Z was then given the go-ahead. But it would take an hour to reach the battle area.

After about 20 minutes, the two battleships sighted a large Japanese air force approaching from the south-east. It was a flotilla of 26 Betty torpedo bombers. Although the planes were hampered by fuel shortages, they made short work of the British battleships.

Repulse was subjected to two skilfully executed pincer attacks. In the first, the old battlecruiser was hit by a torpedo amidships, where she was relatively well protected by her underwater anti-torpedo bulge. Minutes later, the next attack – with the plan to first feign an attack on *Prince of Wales* and then quickly change direction towards the battlecruiser – resulted in four more hits. *Repulse* lost all speed and gained a rapidly increasing list. Nevertheless, she was able to hold out to the last as her anti-aircraft guns shot down two attacking aircraft. All hands were ordered on deck and horrific scenes must have played out as crew deep in the ship tried to fight their way up through corridors of armoured doors, which were difficult to open with the growing list. The extent of the damage and *Repulse's* outdated watertight compartmentalisation caused the battlecruiser to capsize and sink just 11 minutes after the first torpedo hit.

MEANWHILE, THE SLOW and unmanoeuvrable *Prince of Wales* was almost a sitting duck. The ship was hit by four more torpedoes and had a new and increasing list to starboard. Only now did Admiral Phillips finally break his radio silence and, in a brief report to Singapore, request help – from destroyers. In a final bombardment, the *Prince of Wales* was hit by a 500-kg bomb, knocking out her last working boiler room. She lost speed, came to a standstill and slowly sank deeper and deeper. However, it was more than half an hour before she too finally capsized and sank – just after the fighters from Singapore arrived.

The three remaining destroyers (one had been assigned to other duties) that formed the escort of Force Z now made a commendable effort to rescue survivors from the sunken battleships. Fortunately, this work was not disturbed by the Japanese aircraft, which continued to keep the area under observation. The weather also remained calm.

The rapid progress of the sinking of *Repulse* had left survivors in an area littered with debris floating in a large patch of fuel oil. The men in the water – wearing bulky life jackets – had to make their way to the side of the rescuing destroyer and cling to the nets hung over it as best they could. Many did not make the swim or the final climb. On the *Prince of*

Could the losses have been avoided?

★ There is no definite answer, but it is certain that the 453rd Squadron was ready in Singapore to provide Force Z with air cover. Had Admiral Phillips realised the futility of maintaining radio silence after the Japanese reconnaissance planes began to follow the ships, the Japanese attacks would have been met by the fighters. Such a battle could have had a different outcome because the Japanese bombers had no fighter escort.



Brewster Buffalo aircraft with the 453rd Squadron in Singapore in 1941.

AWM



IMPERIAL WAR MUSEUMS

Crew members from the sinking *Prince of Wales* are rescued and transferred to the destroyer HMS *Express*. Many of those rescued were taken back to Singapore and later became prisoners of war after the fall of the city on 15th February 1942.

Wales, the situation was different. Before the ship sank, the wounded and spare personnel could be evacuated directly across a pair of gangways to a destroyer that had come up alongside the battleship, until *Prince of Wales's* list became too great and the destroyer had to withdraw, after which the rescue work continued under conditions similar to those of the *Repulse*.

LIKE SO MANY disasters, this one was the result of a series of actions and coincidences, some of which went back some time. However, a simple act by Admiral Phillips as late as 10.15 could probably have changed the course of the battle. The fighter division off Singapore was intended solely to provide Force Z with air cover, which was part of the plan for the whole operation. Nevertheless, the Admiral maintained an unnecessary radio silence and, for reasons unknown, the fighter squadron never received a launch order. Distance and timing were such that the fighters would have arrived in time if they'd been launched as soon as the Japanese reconnaissance plane was sighted. As the Japanese torpedo bombers had no fighter escort, the battle could have ended in a Japanese rather than a British disaster. But Admiral Phillips did not request air cover. Perhaps he still did not take the threat from the air seriously.

In total, the Japanese deployed 85 torpedo bombers in this operation; 66 attacked, achieving 11 torpedo and two bomb hits. Three aircraft were shot down and one crashed on landing at the home base. Nine airmen were killed. Against this can be set the British losses of 840 dead (including Admiral Phillips), in addition to the two large battleships.

The skilful operation by the Japanese bombers made history. For the first time, a modern battleship manoeuvring at high speed in the open sea had been sunk by airborne weapons alone. Despite efforts to improve their air defences, the list of battleships sunk by bombers and torpedo planes during the war would grow much longer. The Japanese had become the first to show that these ships, once the undisputed rulers of the seas, were now on their way to being consigned to the history books.

Johan Lupander is a military history writer and author.



The British destroyer HMS *Ashanti* is showered with a plume of water around 50 metres high from a detonated depth charge. Convoy PQ18 was attacked in September 1942 by German bombers and U-boats, losing 13 transport ships. HMS *Eskimo* is closest to the camera.

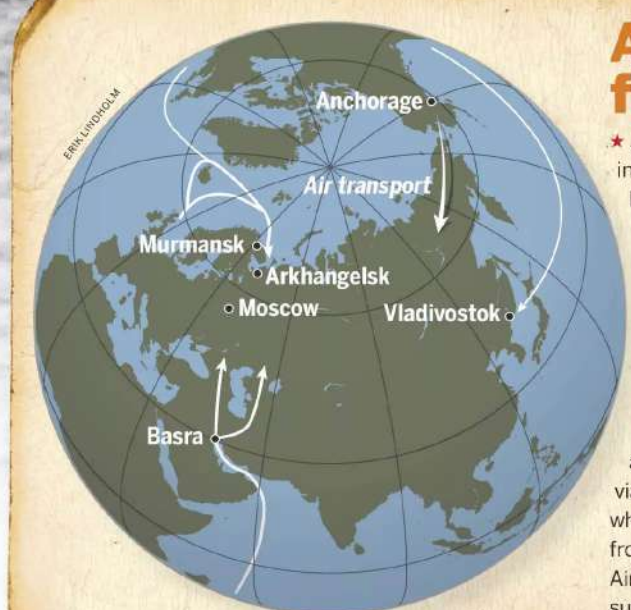
Arctic Ocean 1941-45

BATTLE OF THE CONVOYS

From autumn 1941 to spring 1945, an air and sea war waged with varying intensity across the Arctic Ocean. Germany's aim was to stop Western Allied convoys carrying munitions and supplies to the Soviet Union. With the Kriegsmarine a constant threat, huge British resources were committed to the Arctic.

Text: **JOHAN LUPANDER**

ADMIRALTY OFFICIAL COLLECTION/IMPERIAL WAR MUSEUM



Allied support for the Soviets

★ Just over a month after the German invasion of the Soviet Union in June 1941, Britain sent its first convoy of materiel and supplies to the Soviet Union. When the United States entered the war, aid increased significantly. Three main routes were used for the naval convoys – first to be used was a route from the UK (or US East Coast) to Arkhangelsk or Murmansk through the Arctic Ocean. Later, two alternatives became more important: via the Indian Ocean to Basra in Iraq, where rail transport began, and directly from the US West Coast to Vladivostok. Air transport was also used to ferry supplies from Alaska to Siberia.

In July 1941, Britain and the United States promised to send aid to the Soviet Union to prevent a feared Soviet collapse after the German invasion on 22nd June. The first convoy of war supplies sailed from Scotland in August. Later, a diplomatic agreement (the Moscow Protocol) was reached in which the US and UK promised 400 fighter planes and 500 tanks per month by July 1942, as well as a wide range of other weapons, transport, industrial supplies and raw materials. Everything was supplied free of charge from Britain and on credit from the United States. Initially, a convoy was planned every ten days in each direction across the Arctic Ocean. As the Soviet Union lacked both maritime transport resources and the necessary escort vessels in the area, the traffic was based entirely on Western Allied shipping and escort capacity.

Over the following years, the routes expanded into a worldwide system covering five different ports of embarkation, yet it was the Arctic Ocean convoys that became both the most famous and the most controversial. For more than three years, an air and sea war waged with varying degrees of intensity as Germany aimed to halt the traffic by sinking as many cargo ships as possible.

For six months, convoy traffic in the Arctic Ocean was uninterrupted. Then, in early 1942, the Germans realised its importance to maintaining the Red Army and thus the entire Eastern Front. Stopping the convoys became a major concern for the Wehrmacht and they began to base naval and air forces in Northern Norway. These were mainly torpedo and dive bombers, along with submarines. In practice, surface forces, led by the battleship *Tirpitz*, served more as a perpetual threat to shipping as opposed to an actual fighting force. This was not without significance, however, as the Royal Navy's excessive respect for *Tirpitz* tied up large forces as a safeguard – at least two battleships and an aircraft carrier were, if possible, always on standby.

"STOPPING THE CONVOYS BECAME A MAJOR CONCERN FOR THE WEHRMACHT"

ALLIED FORCES WERE essentially confined to operating from bases in Scotland and Iceland. They comprised mainly naval forces, from battleships, cruisers and destroyers to minesweepers, gradually reinforced by escort carriers and their complement of fighters and anti-submarine aircraft.

In the spring of 1942, a series of battles took place between Allied convoy escorts and German aircraft and U-boats. They were conducted in an Arctic environment that had placed great demands on both personnel and equipment. The summer months had uninterrupted daylight, while an equally long mid-winter period was in almost continuous darkness. The weather could be very stormy and changeable due to the relatively warm sea (which largely didn't freeze even in winter, due to the Gulf Stream) colliding with the cold polar air. Weather conditions limiting visibility were common for the same reason and made the possession of a properly functioning radar (which in extreme cases was also unable to cope with the weather) particularly valuable. U-boats could take advantage of the sea's frequent temperature variations to hide from active sonar. Ice formation on ships and aircraft was also a major problem during the winter months.

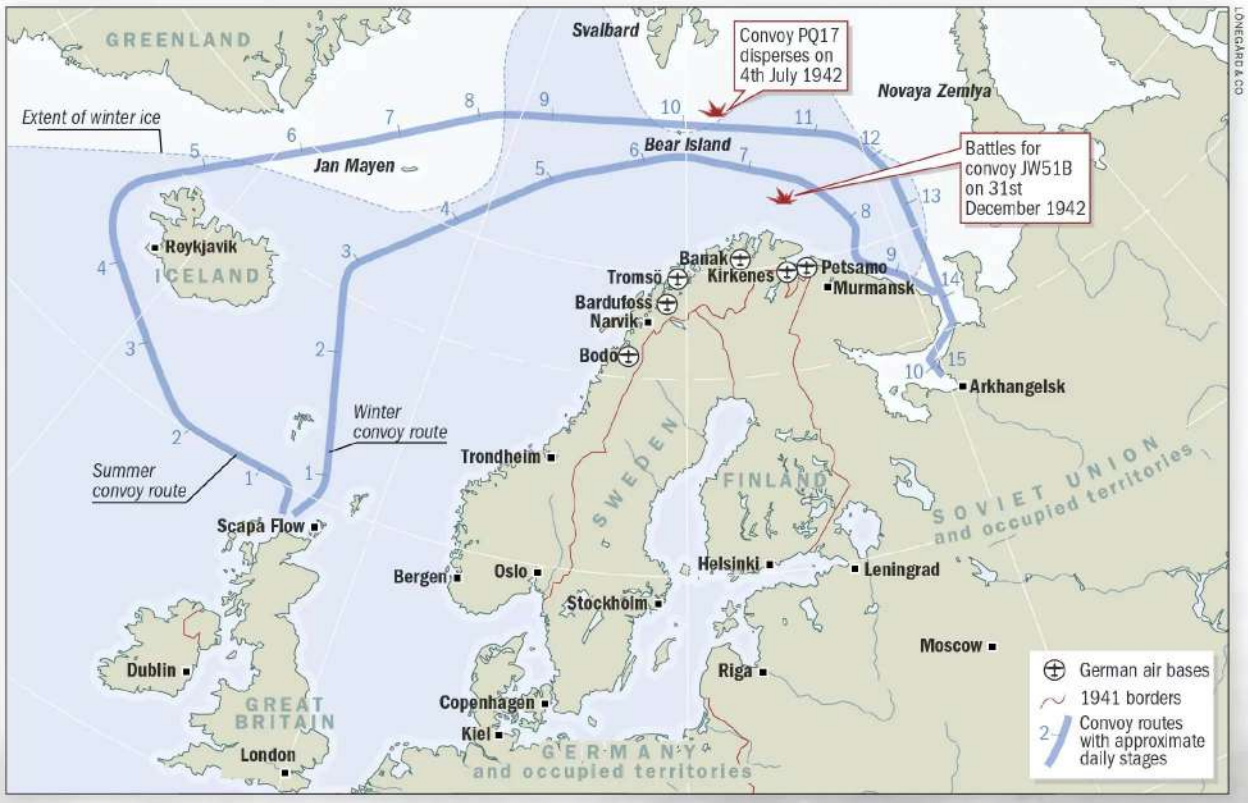
THE MOST NOTORIOUS of the battles in the Arctic Ocean was the attack on convoy PQ17, which was made up of 34 cargo and tanker ships. It sailed on 27th June 1942 from Hvalfjord just north of Reykjavik with a strong close escort against U-boats. This was made up of six destroyers and frigates plus 12 corvettes and minesweepers, while protection against air ▶

Lend-lease solved war financing

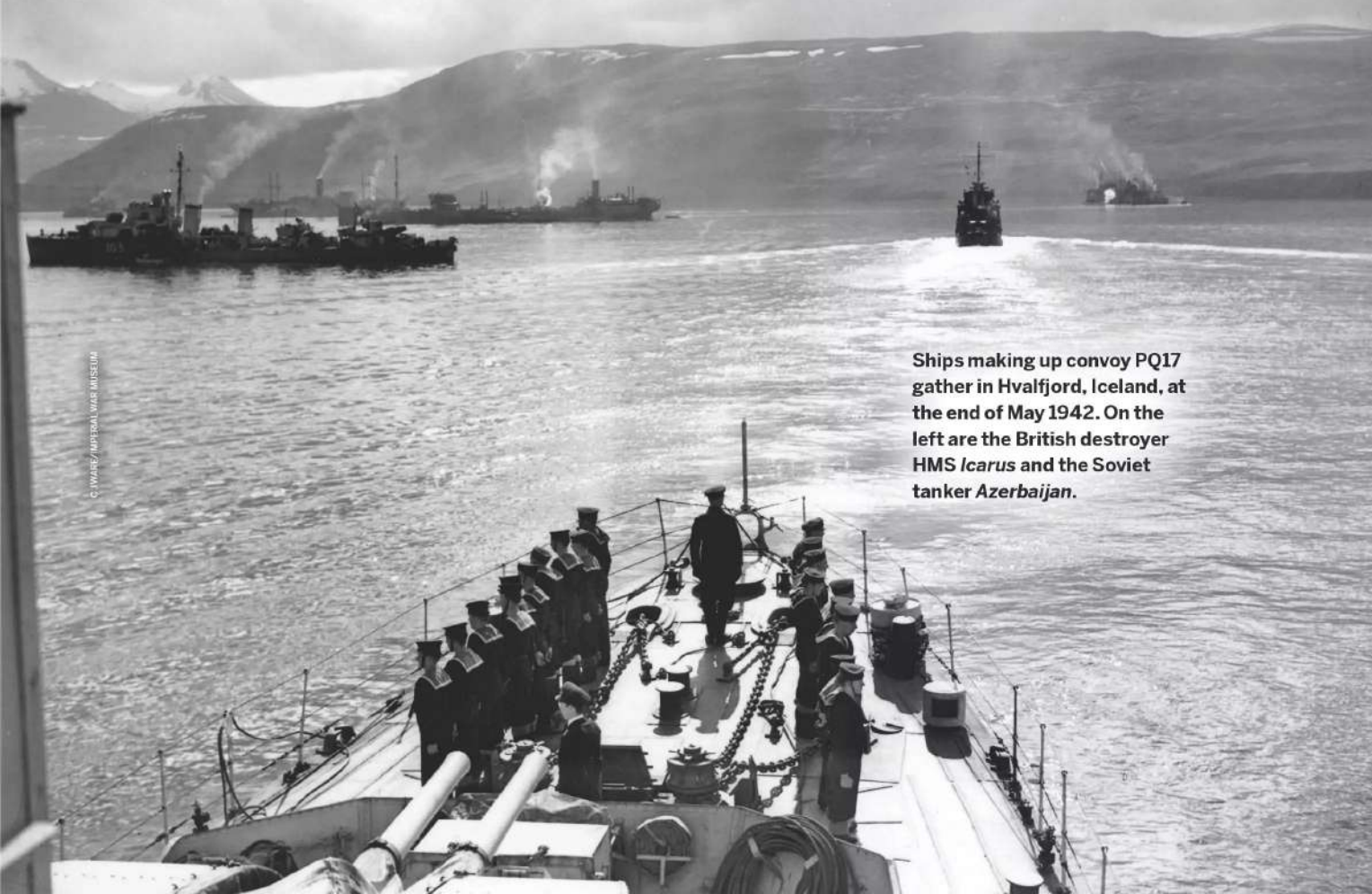
★ The Arctic battles and all the blood lost – by both naval personnel and merchant sailors – were just some of the costs of transporting materiel to the Soviet Union. The financial costs have often been identified with the term 'lend-lease', which requires a more detailed definition.

Shortly after the outbreak of war in 1939, Britain found it difficult to finance its war effort, not least when buying munitions from the United States, who required direct payment courtesy of its laws and Congress's policy of remaining neutral. This was resolved by an agreement in March 1941 in which the equipment was instead lent until the end of the war in return for the UK leasing naval and air bases in Canada and the Caribbean to the US. This allowed the Royal Navy to take on 50 old World War I destroyers from the US Navy, which were still capable of acting as convoy escorts.

The term was then applied to all forms of Allied materiel aid – including that sent to the Soviet Union, even though they were financed in different ways. After the war, the US waived much of the UK's debt.



Because of the winter ice, the Allied convoys were forced to sail closer to Germany's air bases in Norway.



Ships making up convoy PQ17 gather in Hvalfjord, Iceland, at the end of May 1942. On the left are the British destroyer HMS *Icarus* and the Soviet tanker *Azerbaijan*.

© IWM/IMPERIAL WAR MUSEUM

attacks was weaker. Reinforcements included a force of four heavy cruisers, which followed the convoy just beyond the horizon, meaning it could join up within around 30 minutes. There was immense fear of the German battleship *Tirpitz*, which could leave its base in a northern Norwegian fjord and attack the convoy. Therefore, a distant cover force of two battleships and an aircraft carrier cruised around 370 kilometres west of the convoy, ready to intervene if the threat from *Tirpitz* materialised.

THE CONVOY WAS spotted after four days by German aerial reconnaissance, which shadowed it and kept the Wehrmacht informed of its position, course and speed.

Over the following days, PQ17 was subjected to several air strikes that sank two ships. However, this was no worse than anticipated and the plan for the convoy and its various escorts remained unchanged. The plan meant that neither cruiser nor distant cover force would follow the convoy all the way to Murmansk.

The general directives given to the heads of these forces were now expanded and modified by detailed directives from the Admiralty's chief in London, Dudley Pound. This wasn't unprecedented

"THE CONSEQUENCES OF THESE ORDERS WERE DEVASTATING"

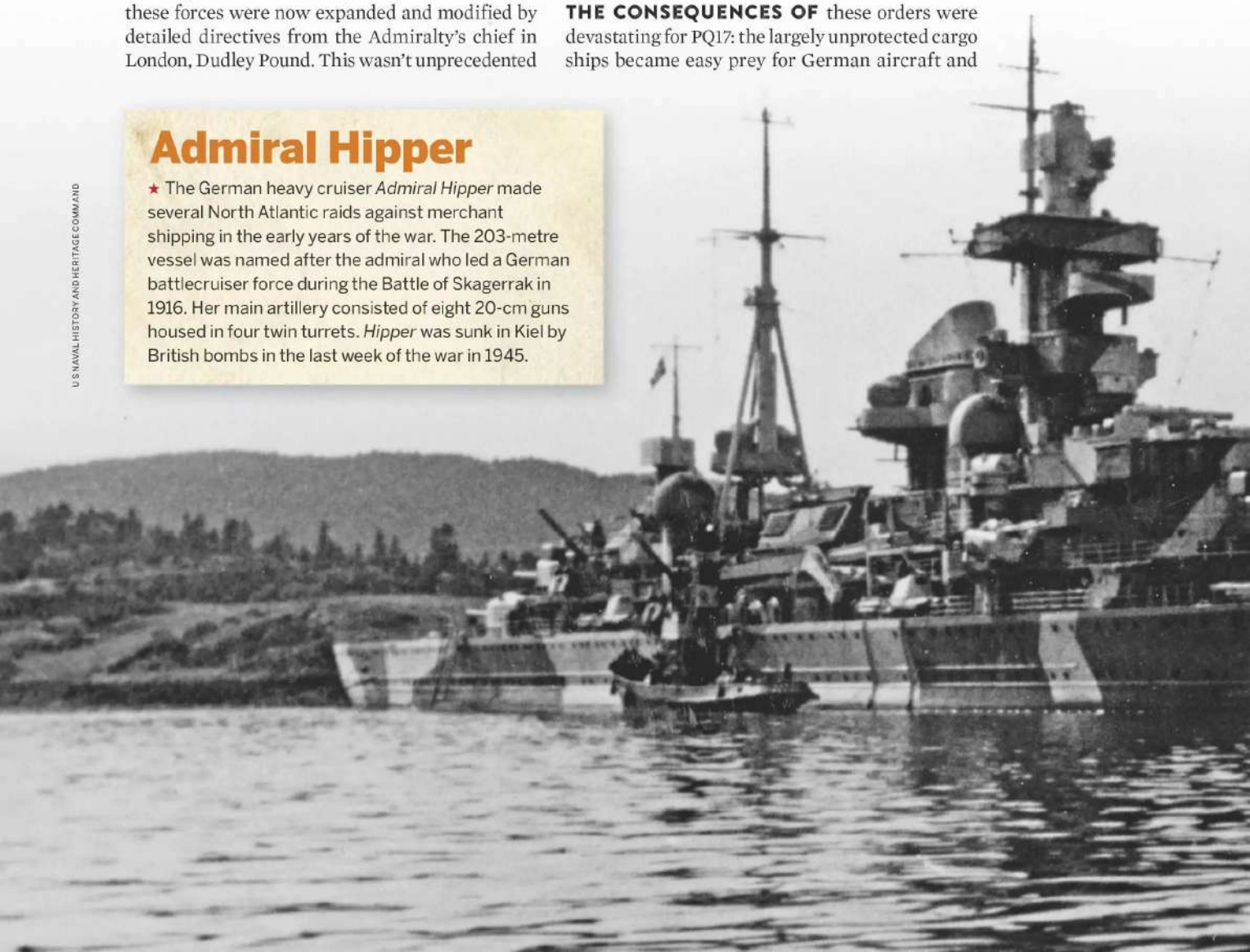
behaviour. At the same time, British naval intelligence believed it had received clear indications that *Tirpitz* was about to sail or had already sailed.

What information these conclusions were based on has never been made public, but one can speculate on Soviet aerial reconnaissance, Norwegian observers on the scene, British submarines or most likely signals intelligence. In any case, the First Sea Lord, suffering from a slow-growing brain tumour, was so concerned by these warnings that he felt the convoy could be attacked by *Tirpitz* at any time. In a series of orders on the evening of 4th July, he commanded the cruiser and distant cover force to withdraw west, while the bulk of the convoy's own escort force was instructed to leave it and also retreat westwards. The convoy was then to be dispersed and its cargo ships would proceed separately to the Soviet port.

THE CONSEQUENCES OF these orders were devastating for PQ17: the largely unprotected cargo ships became easy prey for German aircraft and

Admiral Hipper

★ The German heavy cruiser *Admiral Hipper* made several North Atlantic raids against merchant shipping in the early years of the war. The 203-metre vessel was named after the admiral who led a German battlecruiser force during the Battle of Skagerrak in 1916. Her main artillery consisted of eight 20-cm guns housed in four twin turrets. *Hipper* was sunk in Kiel by British bombs in the last week of the war in 1945.



U S NAVAL HISTORY AND HERITAGE COMMAND

submarines. Some 20 more ships were sunk and only seven reached the Soviet ports. The incident also had negative repercussions for the continuation of convoy traffic and for Soviet confidence in the Royal Navy. It also undermined the US Navy's trust in the Royal Navy's competence, which had serious consequences for future cooperation.

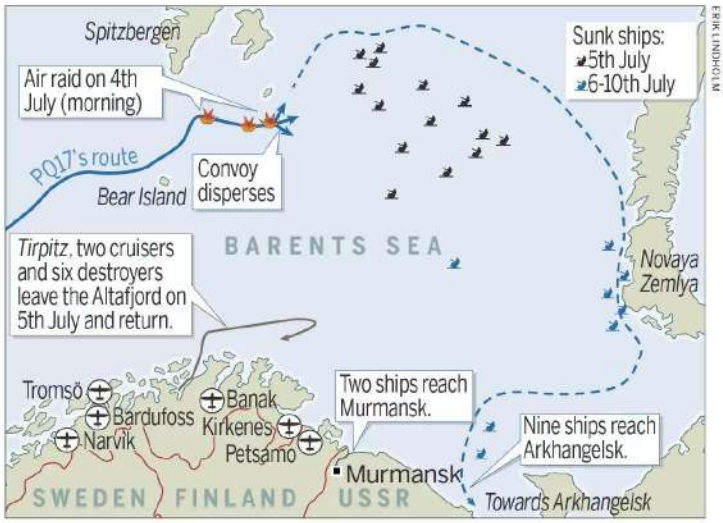
At the same time, the bottom line was that *Tirpitz* – or any other German surface ship – never posed a direct threat to PQ17. In fact, the German battleship and some other units had left port in the early morning of 5th July – several hours after the panicked British decision was signalled to the units – only to quickly return to their safe harbours.

PQ17 AND OTHER convoys suffered such heavy losses – 44 cargo ships were sunk between March and July alone – that all traffic was suspended.

In September 1942, the Allies ventured another run. A large and heavily protected convoy including an escort carrier was able to make it to Arkhangelsk. The Germans managed to sink almost a third of the convoy's cargo ships, but at the cost of heavy losses (six U-boats and 42 aircraft). Three more convoys were launched in 1942. The final one of the year – JW51B – found itself in a frenetic battle on New Year's Eve.

The Battle of the Barents Sea began well before dawn on 31st December 1942. The convoy had passed south-east of Iceland six days previously, travelling under the cover of winter darkness to Murmansk with war supplies. It was now 370 kilometres almost due north of Norway's North Cape.

The convoy comprised 14 cargo ships and tankers, and was surrounded by an escort force of six destroyers with five corvettes and minesweepers under the command of Captain Robert Sherbrooke, commander of the destroyer *Onslow*. Reinforcements were provided by a cruiser

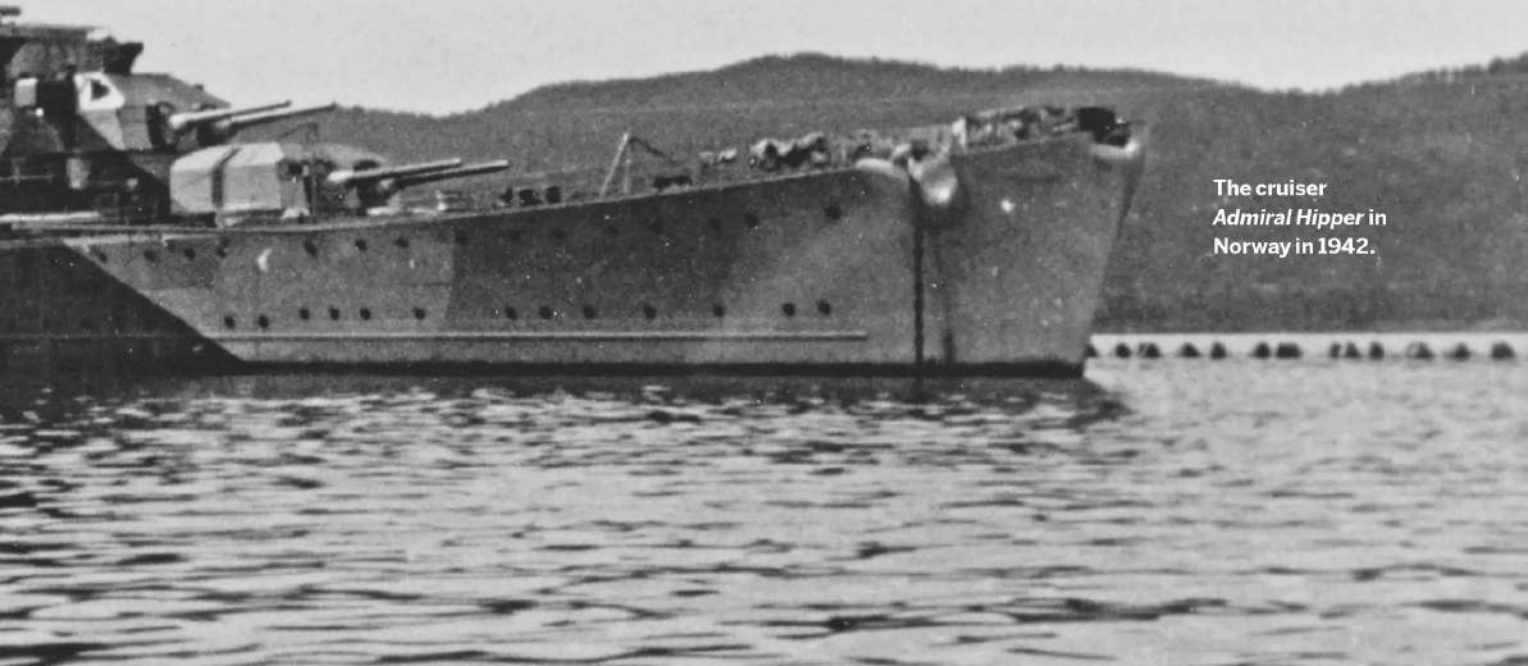


As PQ17 dispersed on the evening of 4th July 1942, the convoy's escort ships turned back west, leaving the 36 cargo ships unprotected.

force consisting of the light cruisers *Sheffield* and *Jamaica* 50 kilometres north of the convoy. At the time, the Germans had at their disposal in Northern Norway the armoured cruiser *Lützow*, the heavy cruiser *Admiral Hipper* and six destroyers.

When the approaching convoy was sighted by a U-boat on 30th December, two operational groups were organised, each with one heavy ship and three destroyers. The operational plan was based on a pincer manoeuvre in which one group from the north (*Hipper* and three destroyers) would engage and attract the convoy escorts, while the other from the south (*Lützow* and three destroyers) would attack the hopefully unprotected cargo ships.

THE GERMAN FORCE commander, Rear Admiral Oskar Kummetz, was in an awkward position because of the strict orders he had received from ▶



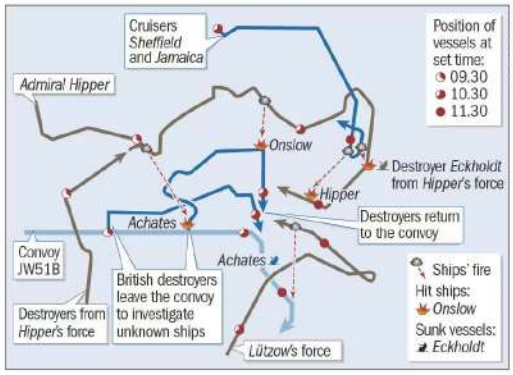
The cruiser *Admiral Hipper* in Norway in 1942.

Hitler to avoid combat even with an equal opponent – Germany's few heavy warships were too valuable to risk. This reduced the Germans' tactical options – for example, night fighting could not be risked. Another problem was that the ability of ships and crews had been eroded by long periods in port, caused by fuel shortages. This was particularly true of the recently arrived *Lützow* after a refit in Germany.

Another influential factor was that it took place on one of the darkest days of the year. In the far north, this meant two and a half hours of shadowy twilight under grey skies, followed by total darkness. The weather was relatively calm but it was misty with frequent snow showers that often reduced visibility to almost zero. Locating, identifying and measuring the range to other ships was very difficult. Both sides had fire-control radars on their ships, but only the British were able to use them.

On the morning of 31st December, it seemed the German plan would be successful. *Hipper's* destroyers passed less than 10 km behind the convoy without sighting it, just before 09.00. At the same time, two of them were spotted by the British destroyer *Obdurate*, which reported this and moved closer. Half an hour later, the two destroyers became three, and when *Obdurate* demanded identification by signal light, the Germans opened fire. The British destroyer – much smaller and less heavily armed than the Germans – immediately pulled back. Sherbrooke on *Onslow* now led three of his destroyers in the direction of the muzzle flashes seen in the distance, while the fifth (*Achates*) was ordered to lay down smoke between the enemy and the convoy.

INSTEAD OF ENCOUNTERING German destroyers, they spotted a large ship heading towards them in the distance. Only when it turned to port and revealed its profile did the British recognise *Admiral Hipper*. Meanwhile, the German cruiser's 20-centimetre guns blazed as she opened



ERIK LINDHOLM

JW51B did not lose any transport ships during the battles of 28th-31st December 1942.

fire – not at *Onslow* and the other destroyers but at the more distant *Achates*. From an artillery point of view, the British were almost hopelessly inferior. Their 10- and 12-centimetre guns could not hope to break through *Hipper's* protective armour. But the destroyers had torpedoes, which the German commander knew to be wary of.

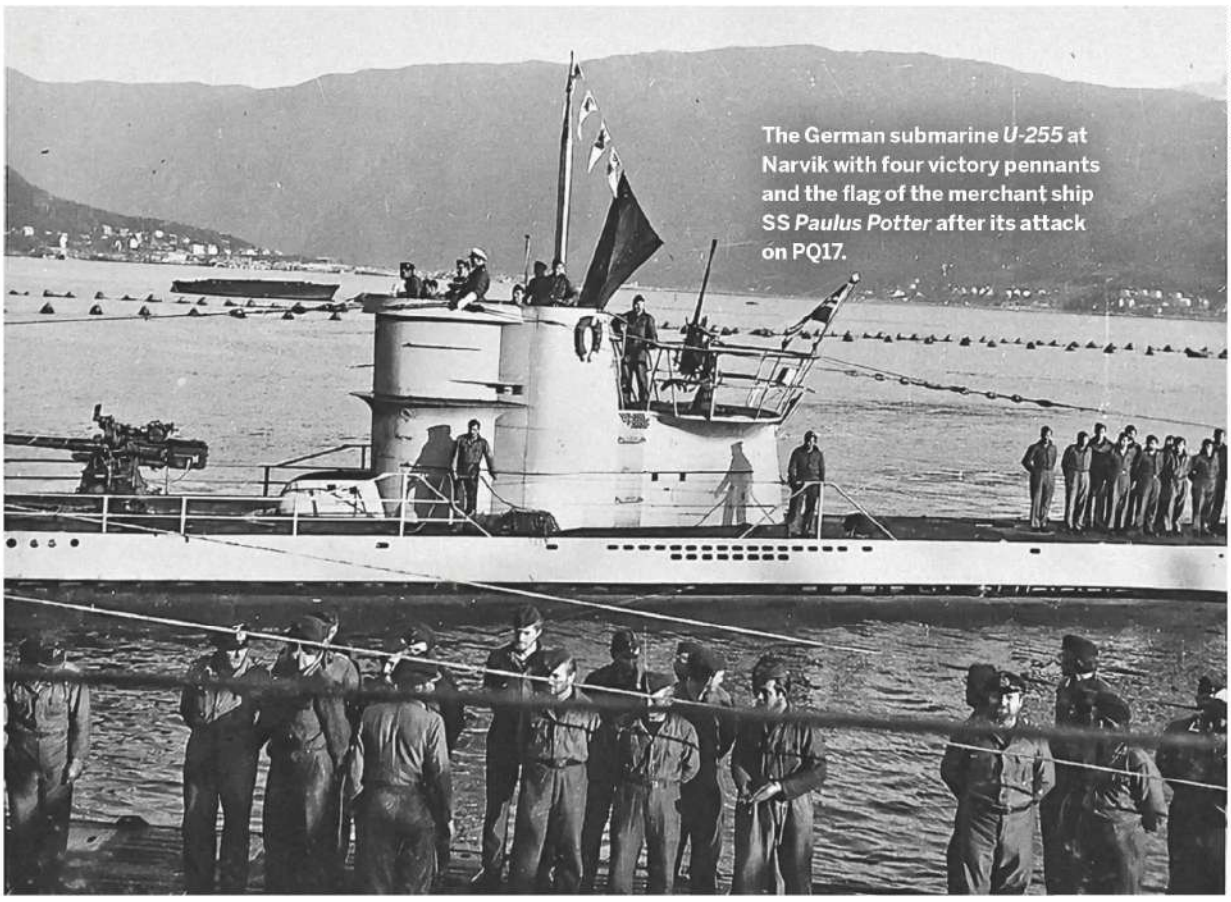
A moment earlier, the British cruiser force in the north had seen the flashes from the gun fire and headed south. Even at top speed, it would take them at least an hour to come to the aid of the destroyers and the convoy.

After only a few minutes, *Achates* had been badly hit by fire from *Admiral Hipper*. She lost speed and started to list. Worse, 40 men, including the captain, were killed. *Achates* continued to lay down smoke to hide the convoy for as long as she could, but when her list reached 60 degrees, the destroyer had to be abandoned. She sank shortly afterwards. Under the cover of her smoke, the convoy had turned south to get as far away from the enemy as possible. They could not know that they were heading straight for the southern German group with *Lützow* and three destroyers. After knocking out *Achates*, the



The Heinkel He-115 was used as a torpedo bomber against the Arctic convoys. The slow aircraft was initially successful but ran into problems as the Allies increased their air defences.

HISTORIC ARCHIVE



The German submarine *U-255* at Narvik with four victory pennants and the flag of the merchant ship SS *Paulus Potter* after its attack on PQ17.

NATIONAL ARCHIVES, NORWAY

German cruiser shifted her fire to *Onslow*, which was not an easy target between the snow showers and the smokescreens. When Sherbrooke and his ship feigned a torpedo attack, the German admiral chose to withdraw, at least temporarily. He was very much aware of the orders to exercise caution, and exposing himself to a torpedo attack in the poor visibility was a risk he did not dare take.

WHEN THE BATTLE resumed, *Onslow* was hit, killing 17 men and severely wounding Captain Sherbrooke. When the British destroyers turned southwards, *Hipper* chose not to follow. Caution still governed German behaviour.

By this time, the two British light cruisers *Sheffield* and *Jamaica* had reached the battle area.

Just as it started to get light, radar contact was made with a large target to the south. Once this was identified as *Hipper*, the British unexpectedly opened fire, hitting the German cruiser with a few bursts. Admiral Kummetz realised that he was now facing an enemy force of at least equal strength and increased his speed to escape. In doing so, he also lost contact with his three destroyers, which had previously joined his ranks. The confusion was

"GERMANY'S FEW HEAVY WARSHIPS WERE TOO VALUABLE TO RISK"

further increased when, in the poor visibility, two of these destroyers thought that *Sheffield* and *Jamaica* were their own ships (an inexcusable mistake – the British cruisers had two funnels, *Hipper* only one) and manoeuvred to join their line. It took only a couple of minutes for *Sheffield* to sink one of them at close range. Meanwhile, *Hipper* continued southwards, firing at British destroyers from long range and then turning to the north-west. The British cruisers were then able to fire on her in turn. After *Hipper* had been hit a couple of times, the German commander decided at 11.45 to call off the battle once and for all, again prompted by Hitler's directive for caution.

While these exchanges were going on in the north, the convoy had continued southwards, protected by Captain Sherbrooke's three undamaged destroyers. He had now handed over command of the force to ▶

"THE GERMANS HAD MISSED A GOLDEN OPPORTUNITY BECAUSE OF HITLER'S EXCESSIVE CAUTION"

► *Obedient's* commander. Although darkness had turned to dawn, visibility remained extremely poor. Snow showers, the smoke from the burning *Achates* and the smoke laid down to mask the cargo ships all contributed to this. With unbelievable luck for the British, *Lützow's* force passed in front of the convoy just three kilometres away at about 10.45 without either group sighting the other – visually or by radar.

LÜTZOW'S FORCE THEN turned eastwards. For an hour, the Germans occasionally and only faintly sighted ships to the south-west. These were from the now-unprotected convoy that was steadily moving southwards, exposed because its escort destroyers were no longer between it and the Germans. Eventually, visibility improved enough for *Lützow* to open fire. The distance was now probably over 10 kilometres, which was still comfortably within range of her 28-centimetre guns. The time was 11.42. This was the situation for which the whole German plan had been concocted – to bring one of their heavy ships within range of the convoy. So far it had worked well.

The armoured cruiser's salvo lasted less than five minutes and was interrupted when Admiral Kummetz announced on the radio that the northern group was breaking off the battle and ordered the southern group to do the same.

Lützow fired 162 shells, more than half of which were of the heaviest calibre. Despite this, she did not secure a single hit. Both German forces now retreated westwards before returning to their base in the Altafjord.

The Germans had missed a golden opportunity because of Hitler's excessive caution. *Lützow's* force had had every opportunity to turn south-west before opening fire, chase the slow and unprotected convoy, and engage in a slaughter at close range.

The failure of the operation prompted Hitler to fire Grand Admiral Erich Raeder in a fit of rage; he also decided to scrap the heavier German ships, a decision he later reversed. Convoy JW51B arrived at its destination with no losses. Captain Sherbrooke survived his injuries, was awarded the Victoria Cross and later became a rear admiral.

In 1943, convoy traffic in the Arctic Ocean was restricted to the dark half of the year. Major battles were now rare – a combination of stronger escorts (usually with one or more escort carriers of their own) and German shortcomings in resources, coordination and leadership. Throughout the year only one cargo ship was lost. In the final days of the year, however, there was a historic naval battle in which the German battleship *Scharnhorst* was sunk. This was partly due to sheer bad luck on the German side, but also to its technically inferior radar.

With this threat removed, convoy traffic continued in full swing throughout 1944. Only the first convoy of the year suffered losses when three cargo ships were sunk. These would become the last of the Arctic War. Well over 300 ships made the journey during the year without any losses. This relatively safe route continued to be used throughout the last months of the war in 1945.

LEND-LEASE AID HAS always been played down in Soviet historiography, which isn't surprising since it tries to present itself as the main bulwark against Hitler's Germany, defeating Nazism almost single-handedly. It's true that deliveries of pure war materiel often consisted of weapons that the Western Allies, for various reasons, did not want themselves: second-rate fighters such as the P-39, Hurricane and P-40, or lightly armed tanks such as the Valentine. However, the figures speak for themselves when it comes to lorries and locomotives, for example. It was these deliveries that kept the Red Army going and freed up Soviet production capacity for arms manufacturing. In terms of value, the aid amounted to around 158 billion dollars in today's money, the equivalent of half of Sweden's GDP.

WHILE THE ARCTIC Ocean convoys have become the most famous, the fact is that the other routes – through Siberia and via the Persian Gulf through Iran – accounted for most of the traffic, largely because they weren't subject to any military threat.

At 15 per cent of the total, the Arctic convoys, for whose protection significant military resources were deployed, did not play a significant role in the Western Allies' provision of materiel assistance to the Soviet Union.

They were, however, more important during the critical period of 1941-42, when they accounted for 80 per cent of all shipments. However, the 262 cargo ships that reached the Soviet Union during this time amounted to no more than 0.5 per cent of all deliveries during the war in terms of volume. The question, therefore, is whether the main importance of the Arctic convoys was psychological at a time when the potential for a forced Soviet peace with Nazi Germany was more than a theoretical possibility.

Johan Lupander is a writer on military history.

The Arctic battles had little impact

★ In August 1941, the first convoy left the UK for the Soviet Union. By the end of the war, 37 more were sent. But it was only in the early years that the Arctic convoys made up a significant part of the transport to the Soviet Union.

ARCTIC CONVOYS 1941-45

	1941	1942	1943	1944	1945	Total
Number of convoys	7	14	6	7	4	38
No. of vessels (sailed)	55	290	113	324	113	895
Sunk by planes		36	1			37
Sunk by U-boats		26		2		28
Sunk (other)		1		1		2
Turned back	1	19	10	5		35
No. of vessels (arrivals)	54	208	102	316	113	793

IMPORTS BY ROUTE (%)

Season (Jul-Jun)	1941–42	1942–43	1943–44	1944–45	Total
Via Arctic Ocean	79	17	5	10	15
Via Persian Gulf	6	40	40	40	35
Via Siberia	15	43	55	50	50

MATERIEL AID IN COMPARISON

Type of equipment	Lend-lease from Allies	Soviet production
Aeroplanes	20,500	135,000
Locomotives	1,981	92
Tanks	12,300	100,000
Cotton (mil. tonnes)	97	6
Wool (mil. tonnes)	50	164

In addition to these figures, the Soviets also received 8,000 other combat vehicles (including half-tracks), 430,000 motor vehicles (mostly lorries, which were crucial to the Red Army's transportation) and 11,500 freight wagons.

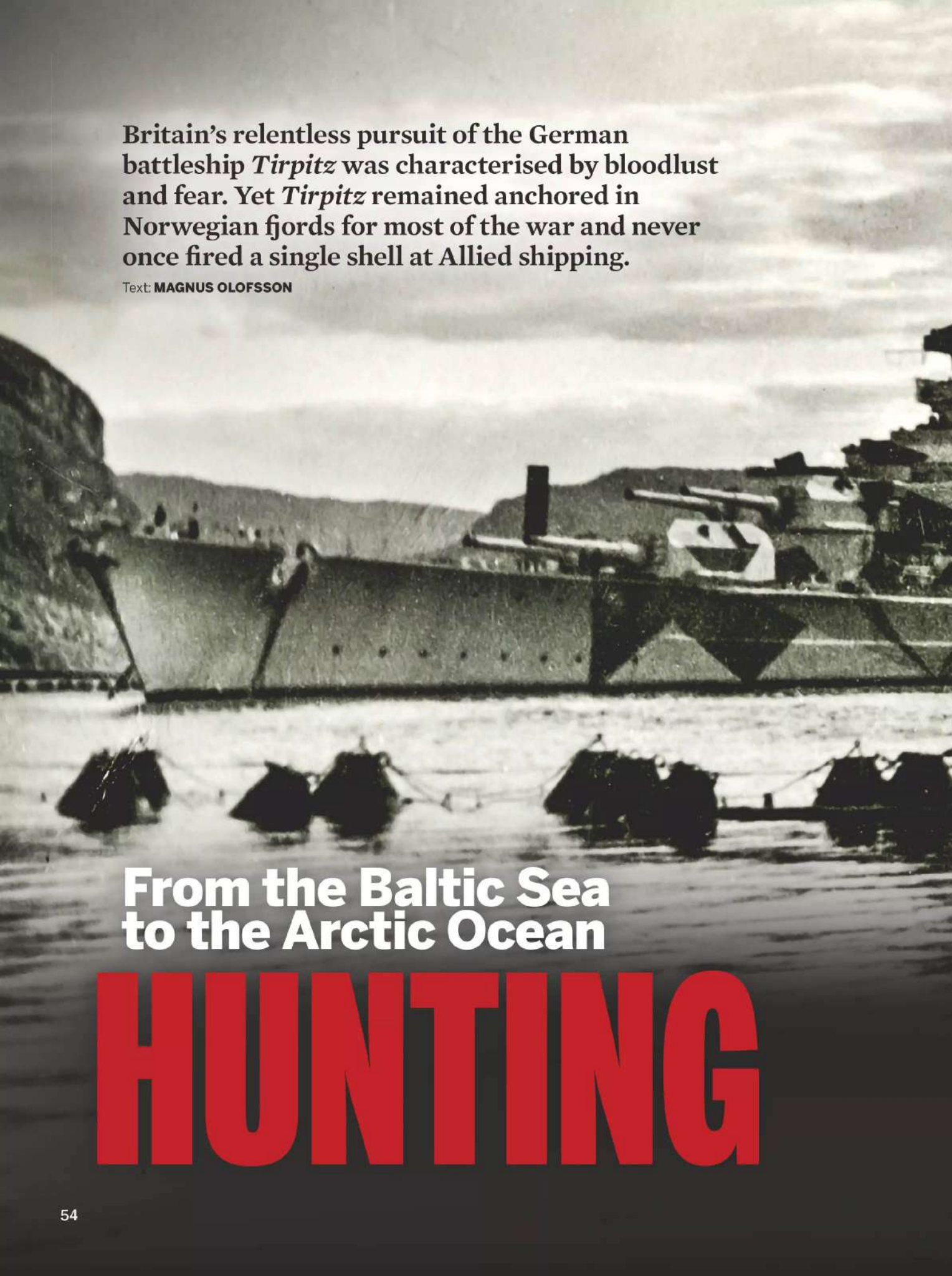
Of the tanks, 4,102 were US M4 Sherman models. However, most were light or infantry tanks. The British Matilda Mk II (1,084 delivered) and Valentine (3,782) were considered by the Red Army to be too lightly armed, as was the US M3 Stuart (1,676). The Sherman's predecessor, the M3 Lee (1,386) was also disliked and was nicknamed the "coffin for seven comrades".

For all the tables, statistical data on convoys vary from one source to another, partly due to different definitions. The above figures are based on the Arnold Hauge Convoy Database (www.convoyweb.org.uk/hague/index.html).



The British light cruiser HMS *Scylla* during a patrol in February 1943. Hot steam was used to remove ice from anchor chains and winches.

J A HAMPTON/IMPERIAL WAR MUSEUM

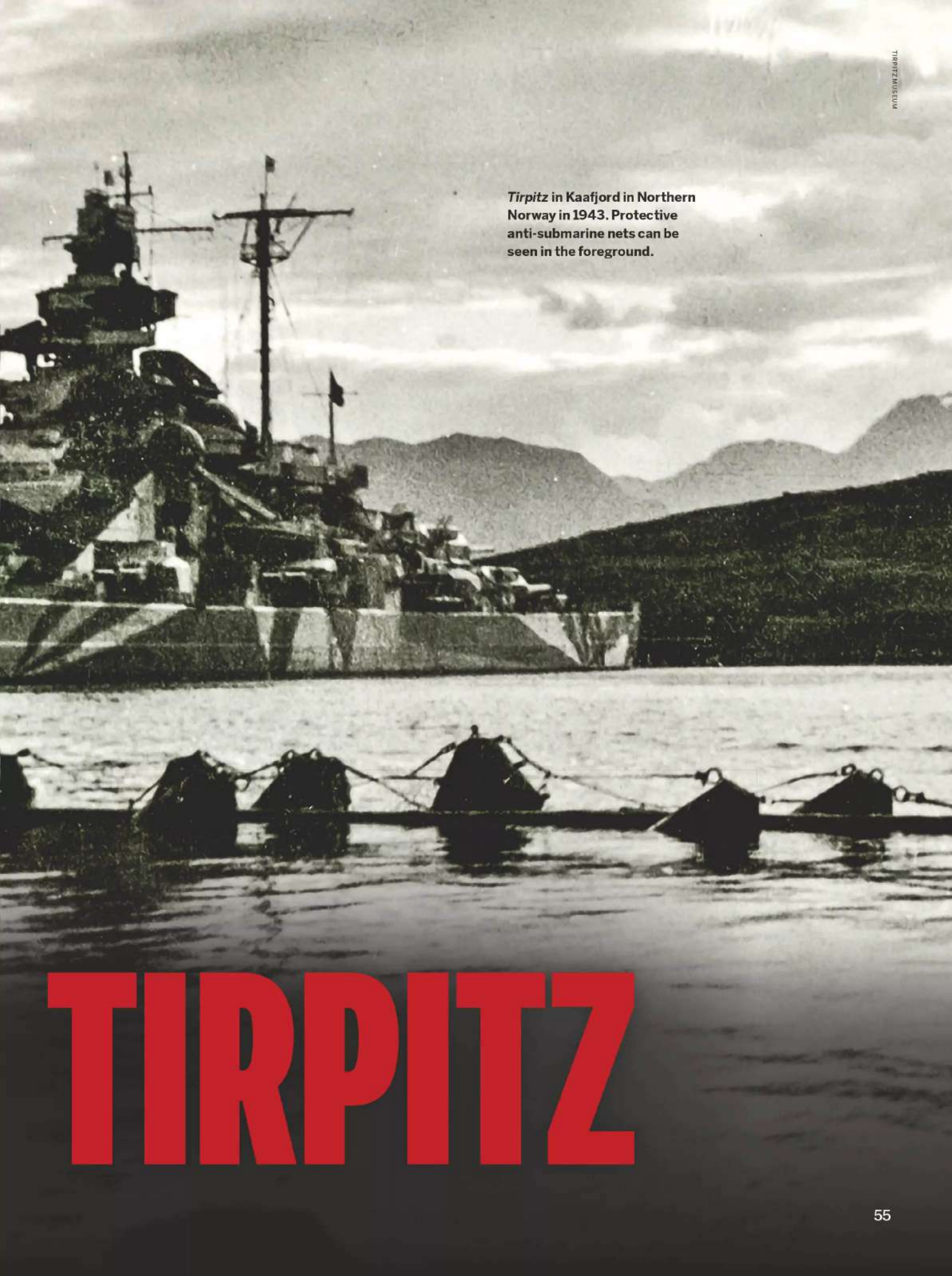


Britain's relentless pursuit of the German battleship *Tirpitz* was characterised by bloodlust and fear. Yet *Tirpitz* remained anchored in Norwegian fjords for most of the war and never once fired a single shell at Allied shipping.

Text: **MAGNUS OLOFSSON**

From the Baltic Sea to the Arctic Ocean

HUNTING



TIRPITZ MUSEUM

Tirpitz in Kaafjord in Northern Norway in 1943. Protective anti-submarine nets can be seen in the foreground.

TIRPITZ

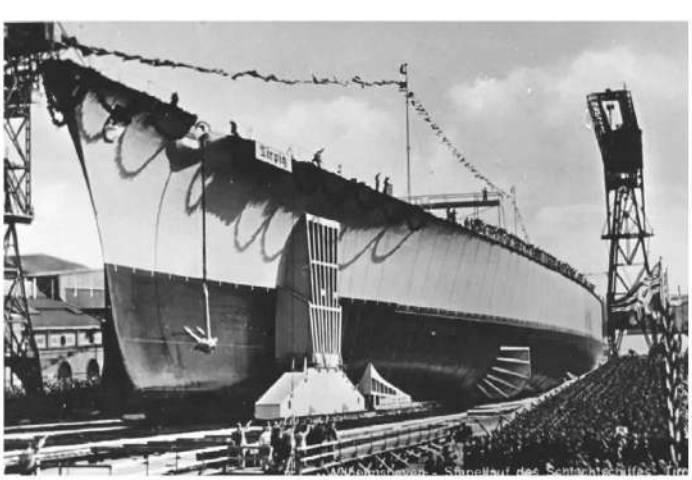
Wilhelmshaven, 1st April 1939. The grey and red hull of a gigantic partially completed boat loomed over the 80,000 people lined up in huge, orderly squares in the port of Wilhelmshaven, cheering and waving their swastika flags despite the cold spring wind. They had travelled from all over Nazi Germany on the Führer's orders. It wasn't every day that Germany launched a battleship – or that they could catch a glimpse of Adolf Hitler.

ON THE PINE-CLAD platform in the shadow of the ship's bow, admirals and generals crowded around. Next to Hitler stood a lone woman wearing a cloche cap and fur stole: Mrs Ilse von Hassell. In photos commemorating the event, she appeared happy, relaxed. In fact, she didn't want to be there. The head of the German Kriegsmarine, newly promoted Grand Admiral Erich Raeder, had politely ordered her to attend. She was the daughter of Grand Admiral Alfred von Tirpitz (1849-1930), the man who'd created the Imperial German High Seas Fleet, and Raeder wanted a relative to name the ship. Von Hassell didn't dare say otherwise.

She found herself called to the microphone: "By order of the Führer and Supreme Commander of the Wehrmacht, I christen you with the name *Tirpitz*," she said, before smashing a bottle of Riesling against the bow. The huge hull slid majestically down the slipway and into the harbour basin. The spectators cheered. 'Deutschland über alles' blared from the loudspeakers. The battleship *Tirpitz* had launched.

She was still just a hull, but once completed *Tirpitz* would become the world's most modern – and Europe's largest – battleship, slightly bigger than her sister ship *Bismarck*. Her main artillery of eight 38-cm guns was more powerful than any Royal Navy battleship's armament and she was faster, too. But her real strength lay in the ship's 18,700 tonnes of armour, which made up a full 40 per cent of her total weight. The British didn't possess a shell that could penetrate her armour at normal combat range, never mind any torpedo that could get past her torpedo bulkheads or bomb that could punch through her decimetre-thick armoured deck. She was virtually unsinkable.

Tirpitz's launch was celebrated with pomp and circumstance.



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Five months to the day after launch, Germany invaded Poland and World War II broke out. For the Kriegsmarine, its strategic position was simple. It was too weak to challenge the Royal Navy in open battle – the Britons possessed 12 battleships, with six more under construction, versus Germany's four. To sustain the war industry and feed its population, Britain was entirely dependent on ocean-bound imports, and German naval command saw the Kriegsmarine's primary strategic task as cutting off Britain's trade routes. They dubbed their proposed overseas guerrilla war a 'cruiser war'.

BRITISH STRATEGISTS FEARED for their transatlantic lifeline. Just days before the outbreak of war, First Sea Lord Admiral Sir Dudley Pound wrote: "Nothing would paralyse our supply system and seaborne trade so successfully as attack by surface raiders." It was through this prism that the Royal Navy's seemingly overzealous efforts to hunt down the pocket battleship *Graf Spee* and battleship *Bismarck* during their operations in the Atlantic should be viewed. When *Bismarck* went down on 27th May 1941, *Tirpitz*, as Nazi Germany's largest and most powerful remaining battleship, came to the attention of Britain's wartime leaders.

Though she would never fire a single shell at an Allied ship from her massive guns, the damage the battleship might do aroused a fear in Britain's top brass that bordered on irrational. *Tirpitz* became a British obsession, not least for Prime Minister Winston Churchill. Her very existence forced Britain to keep strong forces in reserve to meet any possible outcome. Sinking her would release those forces. When the first bombing raid on *Tirpitz* occurred in July 1940, it was the start of a remarkable chase that lasted over four years, consumed huge resources and cost hundreds of lives.

WILHELMSHAVEN, 21ST JULY 1940. The night sky above the city was illuminated by anti-aircraft searchlights. The thunder of its anti-aircraft guns mixed with the engine roar of four Hampden bombers from RAF Bomber Command. Under cover of darkness, they swept over the harbour basin at an altitude of just 10-20 metres in search of the armoured ships *Admiral Scheer* and *Tirpitz*. In their bomb bays lay modified sea mines with parachutes. The pilots had to release them so that they detonated

Air strikes and submarine raids

★ The British tried to sink *Tirpitz* on 26 different occasions – with air raids, special bombs, submarines and manned torpedoes.

NORWEGIAN SEA
When: March 1942
Unit: Fleet Air Arm
Scope: 1 air strike
Damage to *Tirpitz*: None

HÅKØYA
October–November 1944
Unit: Bomber Command
Scope: 2 air strikes
Damage to *Tirpitz*: Capsized

KAAFJORD
September 1943
Unit: Royal Navy
Scope: 3 midget submarines
Damage to *Tirpitz*: Major

February 1943
Unit: Soviet Air Forces
Scope: 1 air strike
Damage to *Tirpitz*: None

September 1944
Unit: Bomber Command
Scope: 1 air strike
Damage to *Tirpitz*: Major

April 1944–August 1944
Unit: Fleet Air Arm
Scope: 7 air strikes
Damage to *Tirpitz*: Light and superficial

KIEL
May 1941–June 1941
Unit: Bomber Command
Scope: 2 air strikes
Damage to *Tirpitz*: None

FÆTTENFJORD
January 1942–June 1942
Unit: Bomber Command
Scope: 4 air strikes
Damage to *Tirpitz*: None

October 1942
Unit: Royal Navy
Scope: 2 manned Chariot torpedoes
Damage to *Tirpitz*: None

WILHELMSHAVEN
July 1940–March 1941
Unit: Bomber Command
Scope: 17 air strikes
Damage to *Tirpitz*: None

NORWEGIAN SEA
NORWAY
SWEDEN
Tromsø
Narvik
Trondheim
SWEDEN
NORWAY
DENMARK
GERMANY
BALTIC SEA

GRAPHICS: JOHNNY ÖBERG



HISTORIE ARCHIVE

***Tirpitz* in Kaafjord in 1944 on one of the few times the British inflicted a hit.**



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Churchill feared that *Tirpitz* would attack British supply lines.

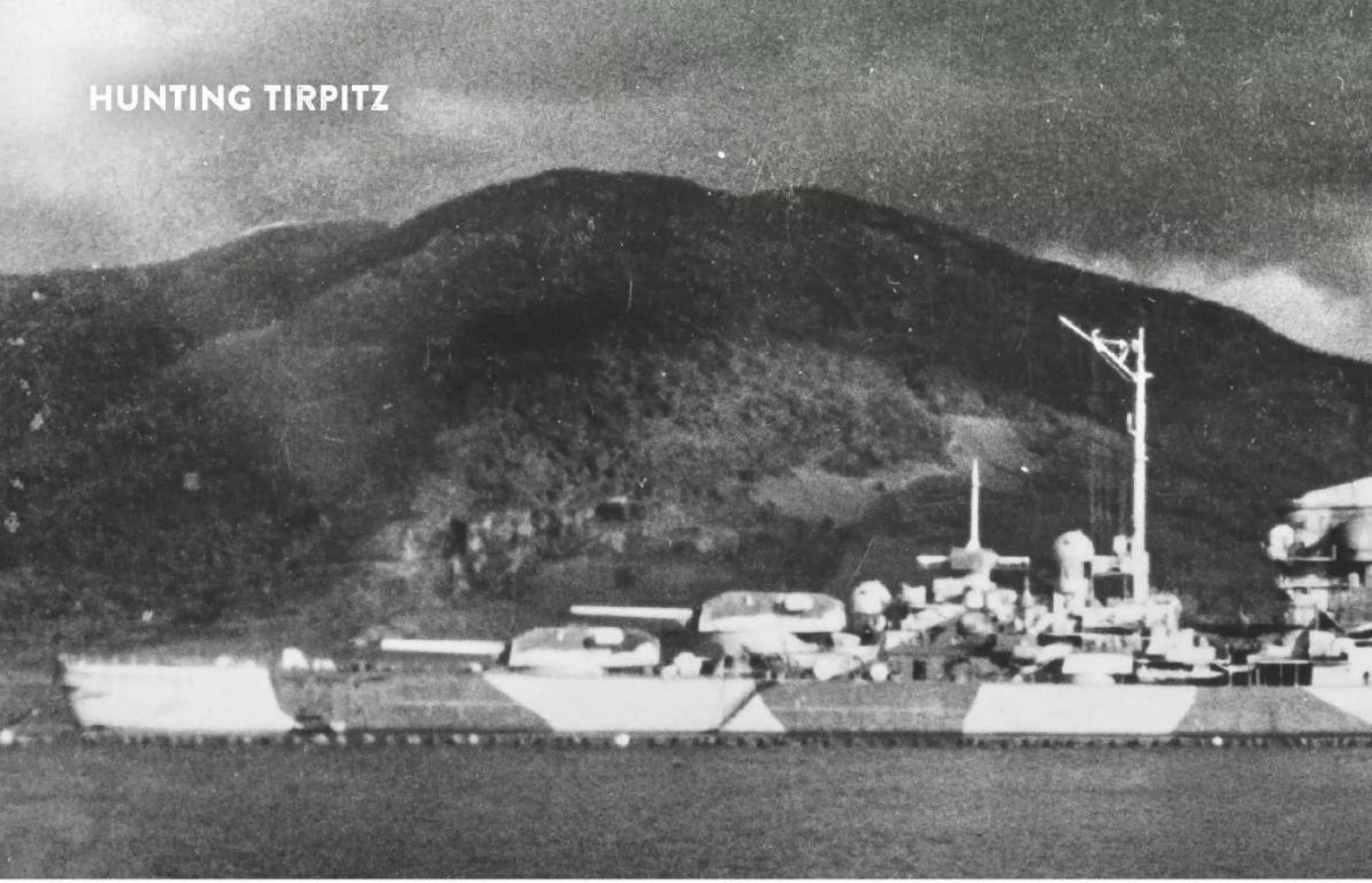
on the seabed under the lightly armoured bellies of the warships. It was a very British plan, original and dangerous. A Hampden was hit by anti-aircraft fire, then a second and a third. They lit up in flames, crashed and exploded. Four crew members died. Eight others spent years of their lives in German captivity. Only one Hampden returned home after dropping its mines haphazardly. *Tirpitz* didn't suffer so much as a scratch.

When *Tirpitz* slid down the slipway on 1st April 1939, she was far from finished. She still lacked a superstructure, armament, captain and crew. She remained in Wilhelmshaven while work on her continued. When the war began, Bomber Command's instructions prohibited attacks on German cities, so she was left undisturbed. The RAF was content to keep an eye on her with

"TIRPITZ BECAME A BRITISH OBSESSION"

regular aerial photo sweeps. By the summer of 1940, however, British intelligence concluded that *Tirpitz* was almost ready. By then the war was in full swing, with most of Western Europe in the hands of Nazi Germany, and Britain seemingly on the brink of defeat. Bomber Command was unleashed.

On the night of 9th-10th July 1940, the first attack was carried out. Fourteen Hampden bombers flew all the way from Britain only to miss with every single bomb. The raid on 20th-21st July was the second. A few days later, a third raid followed. It failed due to bad weather. Not long after, Churchill wrote in a memorandum to the naval and air ministries that ▶



Tirpitz's sister ship *Bismarck* was sunk by the Royal Navy in the Atlantic Ocean on 27th May 1941.

► *Bismarck* and *Tirpitz* were "targets of supreme importance". The haphazard bombing continued. From 9th July 1940 until 1st March 1941, Bomber Command carried out a total of over 500 bombing raids on Wilhelmshaven or *Tirpitz*. Ten aircraft were lost. Not a single bomb or mine hit her.

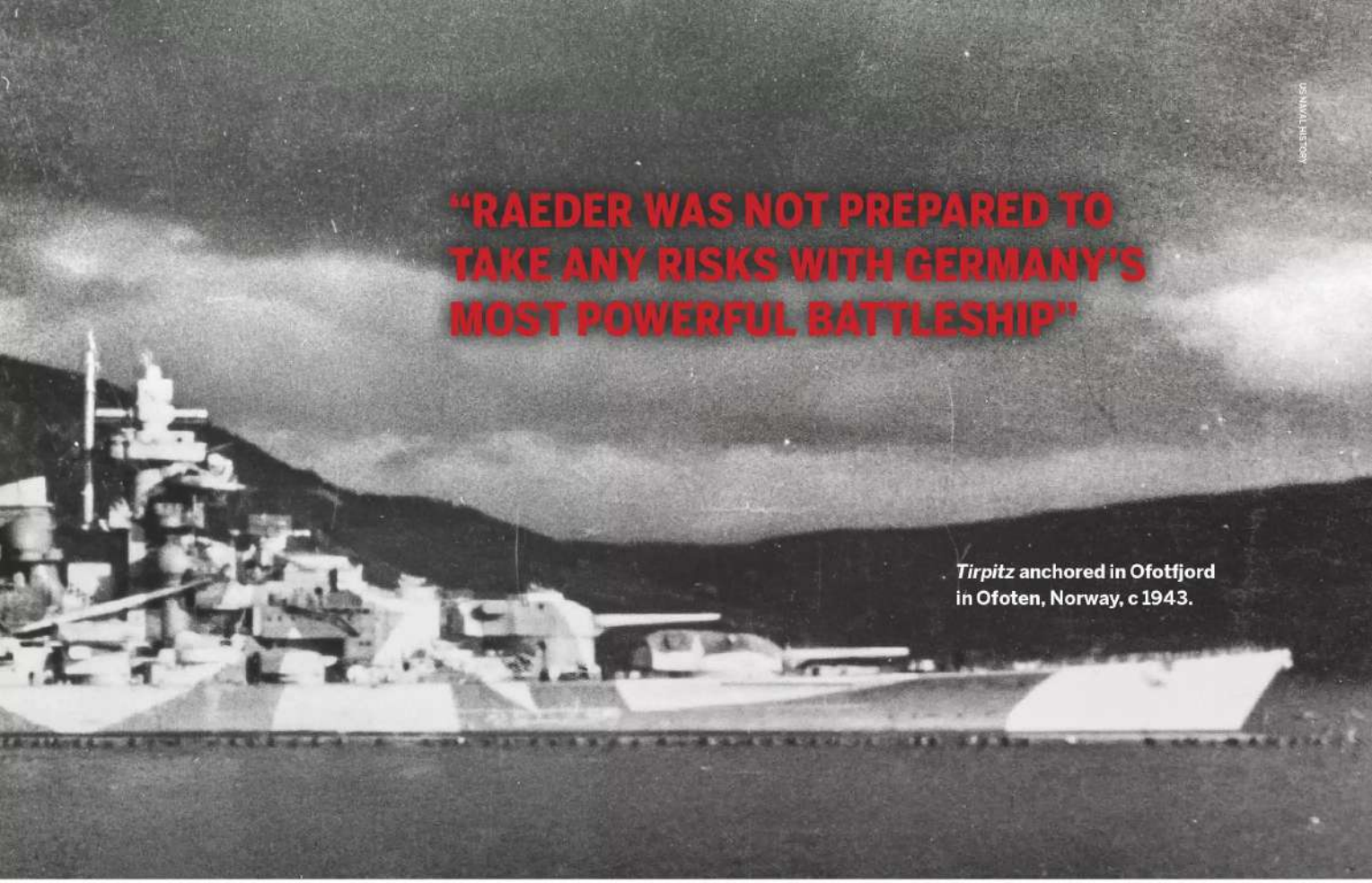
The explanation was simple enough. Despite high expectations, Bomber Command was still a blunt weapon in 1941. Its aircraft's bomb loads were not much to brag about. The planes were so slow and poorly armed that they had to operate at night to avoid being massacred by Luftwaffe fighters. The crews lacked the training and equipment to find their targets. The problem was not that they couldn't hit a battleship, but that they often couldn't locate the right city or even the right country.



WORK ON TIRPITZ continued, undisturbed by the enemy's tragicomic attempts to damage her. On 25th February 1941, she was finally commissioned. Two months later, she steamed under her own power through the Kaiser-Wilhelm (now Kiel) Canal for stationing at Kiel and Gdyna. The latter city was beyond the reach of Bomber Command, but Kiel was not. At the cost of three aeroplanes, Bomber Command managed to destroy a barrage balloon and wound a Kiel resident over the course of 129 raids on *Tirpitz*.

Tirpitz was scheduled to take part in Operation Rheinübung, an Atlantic breakout for cruiser warfare in May, but her first trials showed that she was suffering from mechanical problems. Raeder withdrew her from the operation. Her captain, Karl Topp, protested to a visiting Hitler, who refused to overrule his grand admiral. *Bismarck* had to break out without her sister – with disastrous consequences. On the ninth day, a fortuitous torpedo struck near her rudder, rendering the battleship unsteerable. The Royal Navy sank her in a veritable hurricane of shells and torpedoes.

After that, Raeder was not prepared to take any risks with Germany's most powerful



"RAEDER WAS NOT PREPARED TO TAKE ANY RISKS WITH GERMANY'S MOST POWERFUL BATTLESHIP"

Tirpitz anchored in Ofotfjord in Ofoten, Norway, c 1943.

US NAVAL HISTORY

battleship. *Tirpitz* and her crew members were left to spend the rest of 1941 undergoing tests and exercises in the Baltic Sea. It was January 1942 before she was deemed ready for combat. By then, Hitler had decided to base her in Norway. This was due to an equally unfounded and irrational fear that the Allies were planning to invade the country, occupied by Germany since May 1940.

Raeder did not believe there was such a risk, but still supported the decision. *Bismarck's* fate demonstrated that the Atlantic was dangerous for German battleships. Another factor also came into play after Germany invaded the Soviet Union in June 1941: the Arctic convoys. To support the country, the Allies began shipping convoys of war materiel to the Soviet ports of Arkhangelsk and Murmansk. This naval lifeline was now of the utmost strategic importance. A battleship based in Norway could attack the convoys. Moreover, by her mere presence there, *Tirpitz* would act as what naval strategists call a "fleet in being"; even if she just lay idle in a fjord, the Royal Navy would have to deploy several heavy ships from the Home Fleet to counter any possible attack, ships that would not be able to engage in active operations in the Mediterranean, Indian Ocean or Pacific.

ON 16TH JANUARY, *Tirpitz* anchored in Fættenfjord, less than 30 kilometres from Trondheim, in a narrow fjord that would be her base for more than a year and a half. By then, Britain had been at war with Japan for just over a month and the ships *Tirpitz* tied up were needed in the Far East. In a letter to the First Sea Lord on 22nd January, a harried Churchill wrote somewhat melodramatically that sinking her was worth "the loss of 100 machines or 500 airmen". The only question was where she lay.

The following day, a British reconnaissance aircraft located *Tirpitz*. The report excited Churchill. "The destruction or even the crippling of this ship is the greatest event at sea at the present time. No other target is comparable to it," he wrote, later adding: "The whole strategy of the war turns at this period on this ship, which is holding four times the number of British capital ships paralysed... I regard the matter as of the highest urgency and importance."

The assignment was handed to Bomber Command. In the dark of night on 30th January 1942, nine Halifax and seven Stirling bombers took off from Lossiemouth in northern Scotland. Hopes were high, the weather was atrocious. Only two planes made it to the Trondheim area, where one of them dropped its bombs at random through thick cloud cover. A Stirling was shot down while *Tirpitz* remained in her bolthole, undisturbed and unharmed, still very much a fleet in being.

Article continues on page 62 ▶

TIRPITZ

The Bismarck class battleship was the largest and most powerful in the German navy. *Tirpitz* and her sister were to be deployed in the Atlantic Ocean.

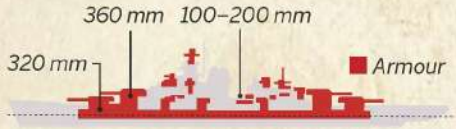


HISTORIE ARCHIVE

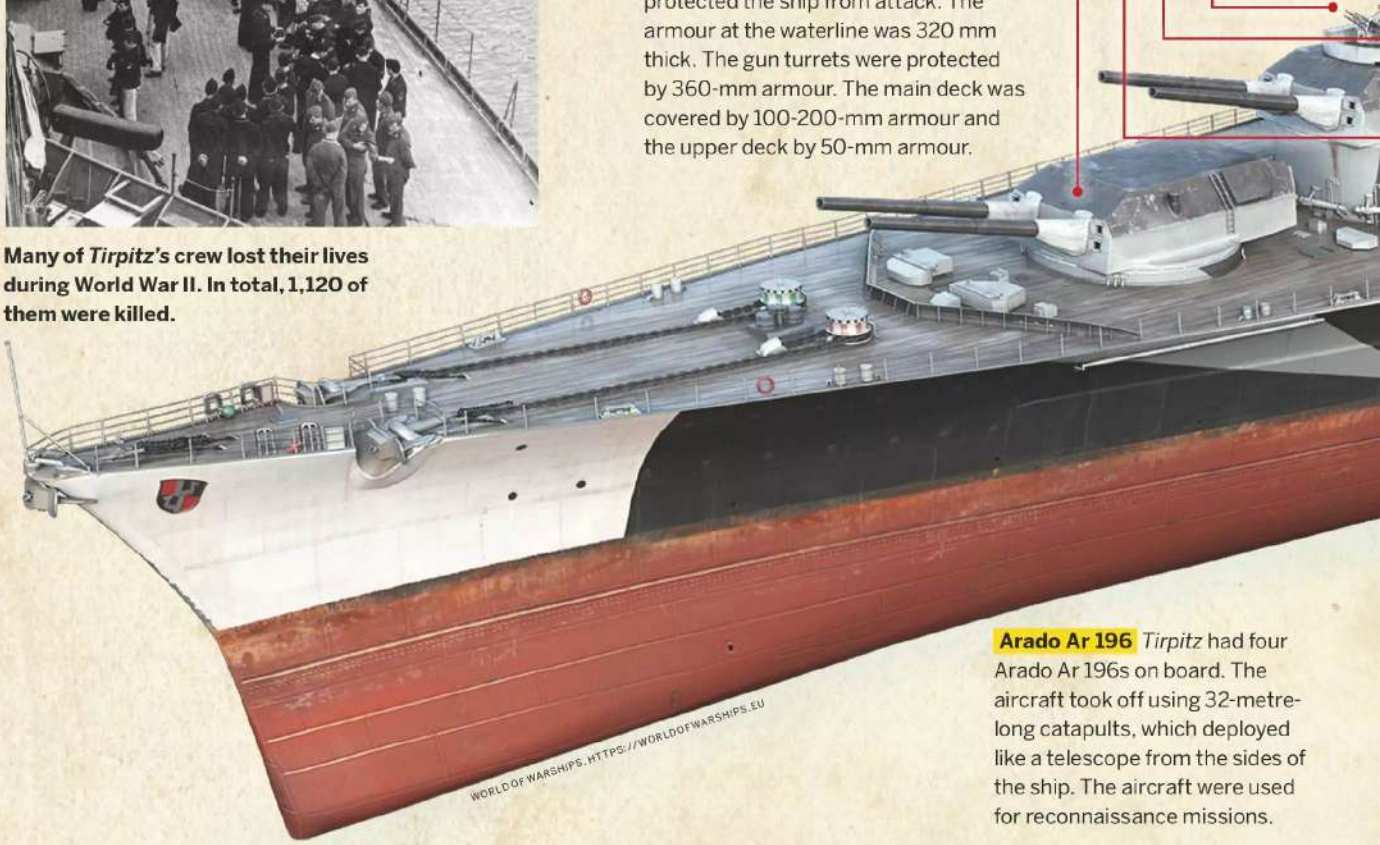
Many of *Tirpitz*'s crew lost their lives during World War II. In total, 1,120 of them were killed.

Armament

- 12x 2-cm C/30 (12 x single mount), later increased to 58x 2-cm, many of which are in C/38 (quadruple mounts).
- 16x 3.7-cm SK C/30 (8 dual mounts).
- 16x 10.5-cm SK C/33 (8 dual mounts).
- 12x 15-cm SK C/28 (6 twin turrets).
- 8x 38-cm SK C/34 (4 twin turrets).



Heavy armour *Tirpitz*'s armour protected the ship from attack. The armour at the waterline was 320 mm thick. The gun turrets were protected by 360-mm armour. The main deck was covered by 100-200-mm armour and the upper deck by 50-mm armour.



WORLD OF WARSHIPS. HTTPS://WORLDOFWARSHIPS.EU

Arado Ar 196 *Tirpitz* had four Arado Ar 196s on board. The aircraft took off using 32-metre-long catapults, which deployed like a telescope from the sides of the ship. The aircraft were used for reconnaissance missions.



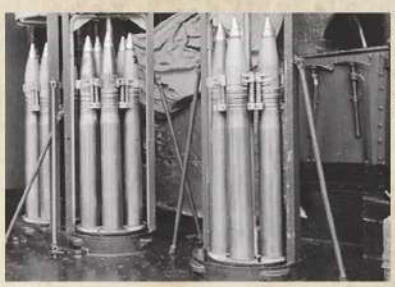
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Adolf Hitler visiting Wilhelmshaven before *Tirpitz's* launch in 1939.



HISTORIE ARCHIVE

***Tirpitz's* crew camouflaging the battleship in Fættenfjord.**

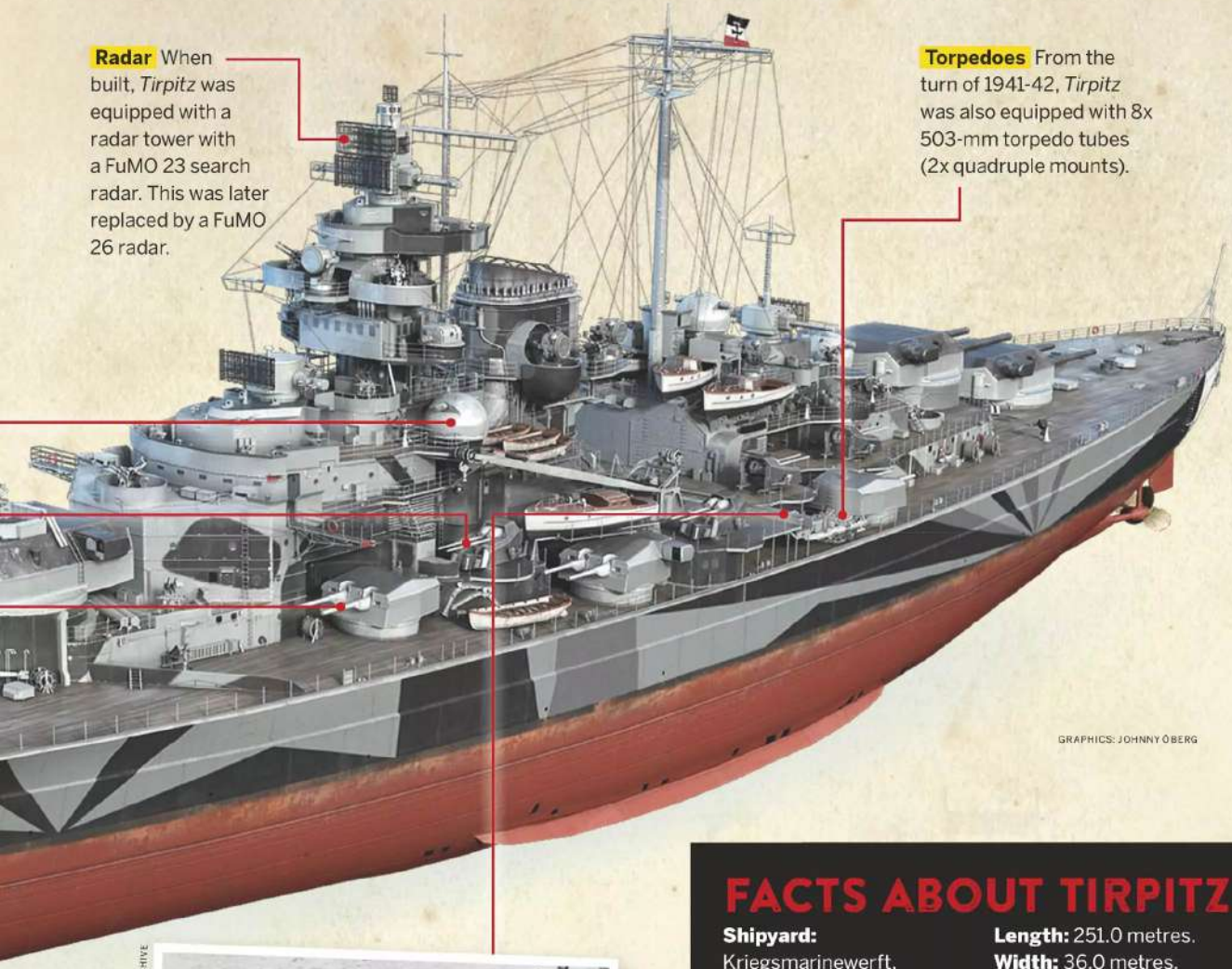


HISTORIE ARCHIVE

10.5-cm anti-aircraft ammunition for the SK C/33 guns on board *Tirpitz*.

Radar When built, *Tirpitz* was equipped with a radar tower with a FuMO 23 search radar. This was later replaced by a FuMO 26 radar.

Torpedoes From the turn of 1941-42, *Tirpitz* was also equipped with 8x 503-mm torpedo tubes (2x quadruple mounts).



GRAPHICS: JOHNNY ÖBERG



HISTORIE ARCHIVE

FACTS ABOUT TIRPITZ

Shipyard: Kriegsmarinewerft, Wilhelmshaven.
Construction cost: 191.6 million Reichsmark.
Laid down: 2nd Nov 1936.
Launched: 1st April 1939.
Entered service: 25th February 1941.
Date sunk: 12th November 1944.
Length: 251.0 metres.
Width: 36.0 metres.
Draught: 10.6 metres.
Displacement: 53,500 tonnes (full load, 1944).
Engine power: 163,026 hp.
Speed: 30.8 knots (57 km/h).
Range: 8,870 nautical miles at 19 knots.
Crew: 108 officers and 2,500 enlisted men (from 1943).

► **WEST OF LOFOTEN,** 9th March 1942. It was 09.17 when three Fairey Alabacore biplanes broke through the cloud cover and descended to 70 metres. In the lead-grey sea, *Tirpitz* moved forward at full speed, just two kilometres distant. This was how *Bismarck's* demise began: with an attack by torpedo planes. This was a golden opportunity, one of the best the Allies would have to sink her. *Tirpitz*'s anti-aircraft guns opened fire with what must have been a deafening sound: 20- and 37-mm automatic guns, the heavy 105-mm anti-aircraft guns, and the 15-cm guns of the secondary artillery. Even the huge 38s were now firing in combat for the first time. The projectiles whipped the surface of the sea. The pilots, with desperate courage, flew straight into the firestorm, dropped even lower and released their torpedoes. They sped towards *Tirpitz* at 75 kilometres per hour, each loaded with 176 kg of Torpex.

Topp didn't hesitate. He ordered, "Helmsman, hard-a-port!" The ship turned 35 degrees so that the torpedoes flew harmlessly by over a hundred metres astern. It was 09.21 when three more Albacores released their torpedoes. All missed. A few more minutes ticked by before six more Albacores came sweeping in from starboard. Two of the aircraft were hit and crashed into the sea. The other four managed to fire their torpedoes before escaping into the clouds. There was silence. The torpedoes streamed towards the battleship – and passed in front of her. After nine minutes, the attack was over. *Tirpitz* was unharmed. On the bridge, Vice-Admiral Otto Ciliax turned to Topp: "You manoeuvred meritoriously, Topp. Lucky ship!" He removed his own Iron Cross and pinned it to Topp's uniform.

Tirpitz had finally, almost halfway into the war, gone to sea on an offensive mission. A German Fw 200 Condor spotted convoy PQ12: 17 ships heading for Murmansk at around noon on 5th March. German command also knew that convoy QP8 was heading in the opposite direction with 15 ships. The



HISTORIE ARCHIVE (2)

Captain Friedrich Karl Topp inspects the sailors on board *Tirpitz* in 1941.



***Tirpitz* hidden in Fættenfjord near Trondheim.**

Arctic Ocean was full of tempting targets. The Naval Staff gave Operation *Sportpalast* (Sports Palace) its blessing. Ciliax in his role as Commander, Battleships, personally took command of the naval force.

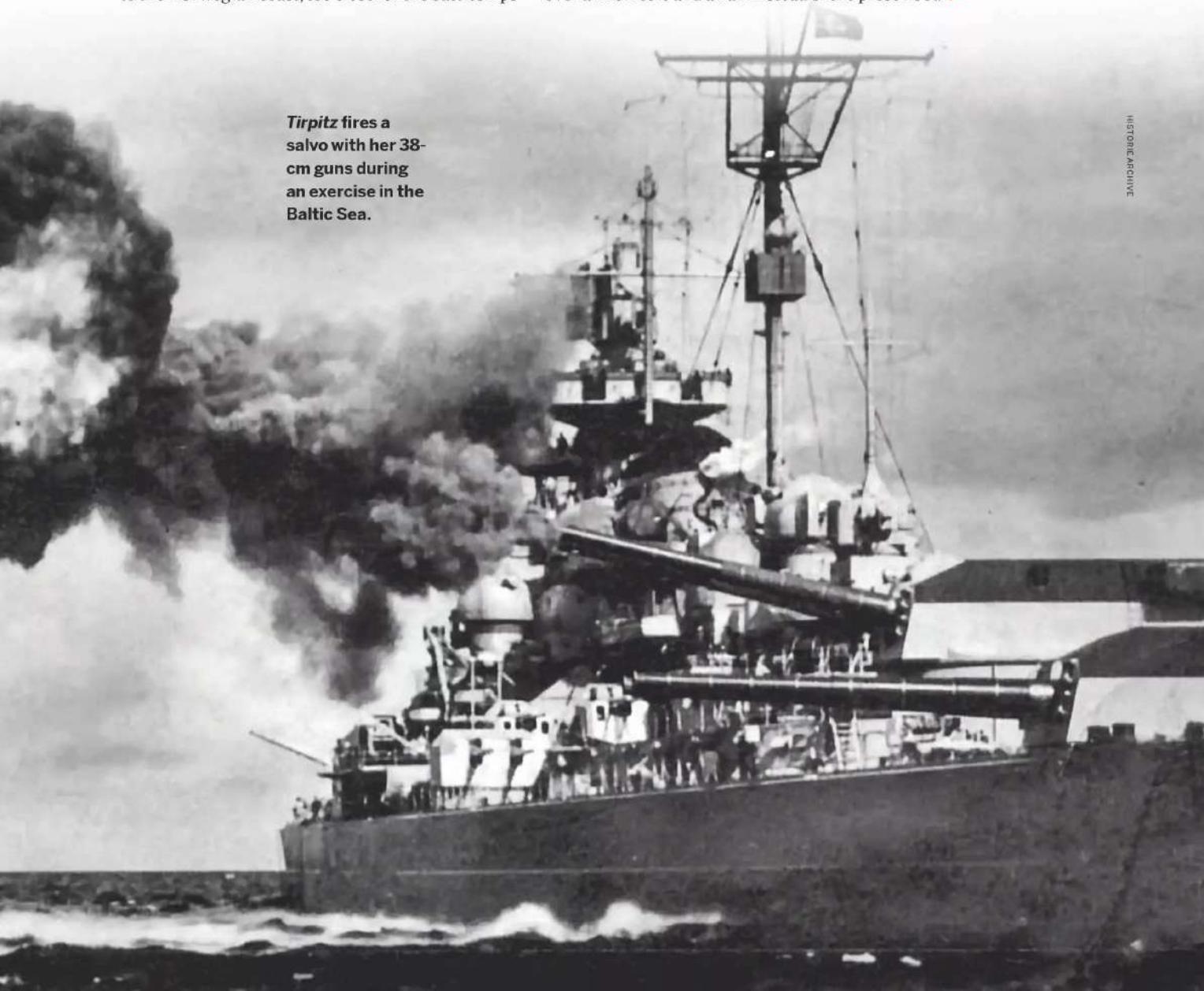
ON THE MORNING of 6th March, *Tirpitz* and three destroyers weighed anchor and headed into the Norwegian Sea. There was no sign of PQ12 and all that was found of QP8 was a lone straggler. The destroyers sank her. Turning back towards Norway to refuel, *Tirpitz* continued the chase alone – without ever catching a glimpse of the defenceless merchant ships. On the evening of 8th March, Ciliax cancelled the operation.

But the hunters were themselves being hunted. Three battleships and a battlecruiser under Admiral Sir John Tovey simultaneously searched frantically for *Tirpitz*. However, it was British signals intelligence that caught her in its net, close to the Norwegian coast, too close for the battleships

"TIRPITZ'S ANTI-AIRCRAFT GUNS OPENED FIRE WITH ... A DEAFENING SOUND"

to have a chance to chase her. However, Tovey had another weapon in his arsenal: the aircraft carrier HMS *Victorious*. An attack by her torpedo planes couldn't sink *Tirpitz* but might damage her enough for Tovey's heavy ships to catch up with her.

The plan failed because the attack was carried out with obsolete aircraft flown by poorly trained crews led by an inexperienced officer. The torpedo attack on *Tirpitz* was not carried out according to the manual: coordinated and from both sides. Moreover, *Tirpitz*'s huge size fooled the pilots into releasing their torpedoes at too great a distance, over a kilometre and a half instead of the prescribed ►



***Tirpitz* fires a salvo with her 38-cm guns during an exercise in the Baltic Sea.**

HISTORIE ARCHIVE

► one kilometre. The opportunity to do a *Bismarck* on *Tirpitz* thus passed the Home Fleet by. On 13th March, she anchored again in Fættenfjord.

The attack off Lofoten, however, had frightened Hitler so much that he now ordered *Tirpitz* was not to embark on any further adventures unless the Royal Navy's carriers were first neutralised. Raeder was of the same opinion. In practice, this meant that *Tirpitz* was reduced to a fleet in being only. However, nobody in the British wartime leadership knew this. They lived under the imagined threat of a breakout in the Atlantic. And if *Tirpitz* broke out, sooner or later she would have to seek shelter for bunkering and repairs in the French port of Saint-Nazaire, site of the world's largest dry dock, as well as the only one along France's Atlantic coast large enough for a battleship. It was where *Bismarck* had tried to go when she was sunk during her attempted escape.

If the dry dock was destroyed, *Tirpitz* could no longer make a break for the Atlantic. But because the dock was so large that Bomber Command's bombs couldn't damage it, another way had to be found.

COMBINED OPERATIONS HEADQUARTERS, whose mission was to conduct commando raids on the mainland, began planning Operation Chariot as early as January 1942. The result was imaginative and foolhardy in classic British fashion, practically a suicide mission. The head of the company, Lieutenant Colonel Charles Newman, told his men that "we cannot hold much hope of you getting out again". They were invited to withdraw. Not one drew back from the daring plan.

"WATER FLOODED THE DRY DOCK, WHICH LAY WRECKED FOR THE REST OF THE WAR"

On 26th March 1943, a flotilla comprising the obsolete destroyer *Campbeltown*, 16 small motor boats, a motor gunboat and a motor torpedo boat departed Falmouth towards German-occupied France. The guardian angel for fool's errands did its job; the squadron was almost inside the port of Saint-Nazaire before it was discovered, just after midnight on 28th March. German coastal artillery began slaughtering the small ships, packed with commandos. However, they failed to stop *Campbeltown* from running like a kamikaze ship straight into the dock's ten-metre-thick lock gates. Nor did they stop all the commandos. Those who came ashore quickly blew up the pump house and the winches of the dry dock gates before escaping into the countryside, being shot or forced to surrender.

However, it didn't quite end there. At 05.30, Saint-Nazaire was shaken by a violent explosion. *Campbeltown* was carrying 24 depth charges with a total of over four tonnes of amatol, embedded in concrete and fitted with a timed detonator. Tens, if



The destroyer *Campbeltown* was loaded with charges and rammed the gates of the dry dock.

HISTORIC ARCHIVE (2)

Aerial view of the harbour of Saint-Nazaire in 1942. The town in France was a German U-boat and ship base until 1943.

not hundreds, of soldiers and civilians were killed instantly. The destroyer and caisson doors were completely destroyed. Water flooded the dry dock, which lay wrecked for the rest of the war. The price was high, however, in materiel and human terms. Fifteen of the 18 small ships were lost. Out of 622 sailors and commandos, 169 were killed. A further 215 became prisoners of war. The British celebrated with a shower of medals – five Victoria Crosses were awarded – unaware that the whole operation had been completely unnecessary, as *Tirpitz* was already saddled with a no-breakout clause.

HOWEVER, THE APPARENT success of Operation Chariot did not detract from the fact that *Tirpitz* remained fully operational. And Arctic convoy season was approaching. The task of sinking her once again went to Bomber Command. Bitter experience had shown that the RAF's armour-piercing bombs were too weak to penetrate the armoured decks of heavy German warships. Instead, they decided to test two new weapons. Neither had been used against a battleship before. A first wave of aircraft planned to pulverise *Tirpitz* with 4,000-pound high-capacity bombs, each loaded with 1,307 kilograms of amatol. They'd originally been designed to blow out entire blocks of flats and were nicknamed blockbusters or cookies. A second wave would then drop converted Mark XIX spherical contact mines from 200 metres in the vague hope that it might do "serious underwater damage", as Air Chief Marshal Portal optimistically informed Churchill.

The bombers took off from their bases in Scotland at 18.00 on 30th March. When they reached the target area after four hours of flying, *Tirpitz* was covered by thick cloud. To avoid giving away the ship's position, Topp forbade his anti-aircraft gunners to open fire. There was no need to do so. *Tirpitz* was now protected by land-based anti-aircraft guns and searchlights. Four aircraft were shot down over the fjord. Two more were so badly damaged that they crashed into the sea on their way home. Only three of the 34 aircraft dropped their blockbusters. *Tirpitz* escaped completely. The failure meant that the whole attack had to be repeated. The plan was the same except that the pilots were instructed to drop their bombs at a height of under 100 metres, lower than *Tirpitz*'s highest mast. As the ship was in a narrow valley with steep sides, they also risked flying straight into a rock face after dropping their mines. The crews were told that the mission was of the utmost importance. Churchill himself messaged them to say "[you] will be proud to tell your grandchildren".

On 27th April, they set off again. The weather was perfect for bombing, but despite the RAF's best efforts, the aircraft were detected by German radar. Parts of the first wave got their bombs off. Then the ship began to be wrapped in a white fog: haze from chemical smoke generators. Despite anti-aircraft fire from the beaches and *Tirpitz*, most aircraft dropped their bombs. All blockbusters missed. All mines missed. The most tangible result of the raids was large quantities of dead fish.



IMPERIAL WAR MUSEUM

A blockbuster bomb is loaded into a Vickers Wellington bomber.

The following night, Bomber Command made a third attempt. This time the Germans were on alert. Artificial fog covered the battleship before a single bomb fell. The aircraft dropped 18 blockbusters and 48 mines without a single hit. The three attacks cost Bomber Command one Lancaster and 12 Halifax bombers. Sixty crew members were killed and 18 became prisoners of war. *Tirpitz* was undamaged – and now it was spring, the nights were getting lighter and more dangerous. There was no sign that Bomber Command could overcome *Tirpitz*. It was time for other forces to take over. The next attack, however, was slow in coming. Before then, just over two months later, *Tirpitz* was able to make her most important active contribution of the entire war.

ARCTIC OCEAN, 4TH July 1942. It was evening as convoy PQ17's 32 ships travelled at nine knots across the Arctic Ocean. In their holds they carried enough munitions to equip the army and air force of a medium-sized country. So far, their journey had gone as well as could be hoped. Suddenly Coxswain Sidney A Kerslake of the small anti-submarine trawler *Northern Gem* noticed signal flags being hoisted from the masts of the convoy's strong escort of destroyers ▶



HISTORIE ARCHIVE

Dance show for the crew on the deck of *Tirpitz*, circa 1943.

"AT LEAST TIRPITZ GOT TO FIRE HER MIGHTY 38S"

and cruisers. Signal lights flashed in all directions. It was obvious that something big was happening. Soon it became clear: the convoy was to be dispersed, by order of the Admiralty. The German High Seas Fleet had left its Norwegian bases.

"What are we splitting up for, we're better off as we are, on our own we have no chance at all," Kerslake exclaimed angrily. He was 22 years old and wanted to survive the war. He knew that all experience showed that ships in a convoy were much safer than ships on their own. Dismay spread throughout the small warship; it would continue towards the Soviet Union while the destroyers and cruisers fled back home. Kerslake thought of his mother. As did many other men on the doomed merchant ships that were now spread out across the grey sea.

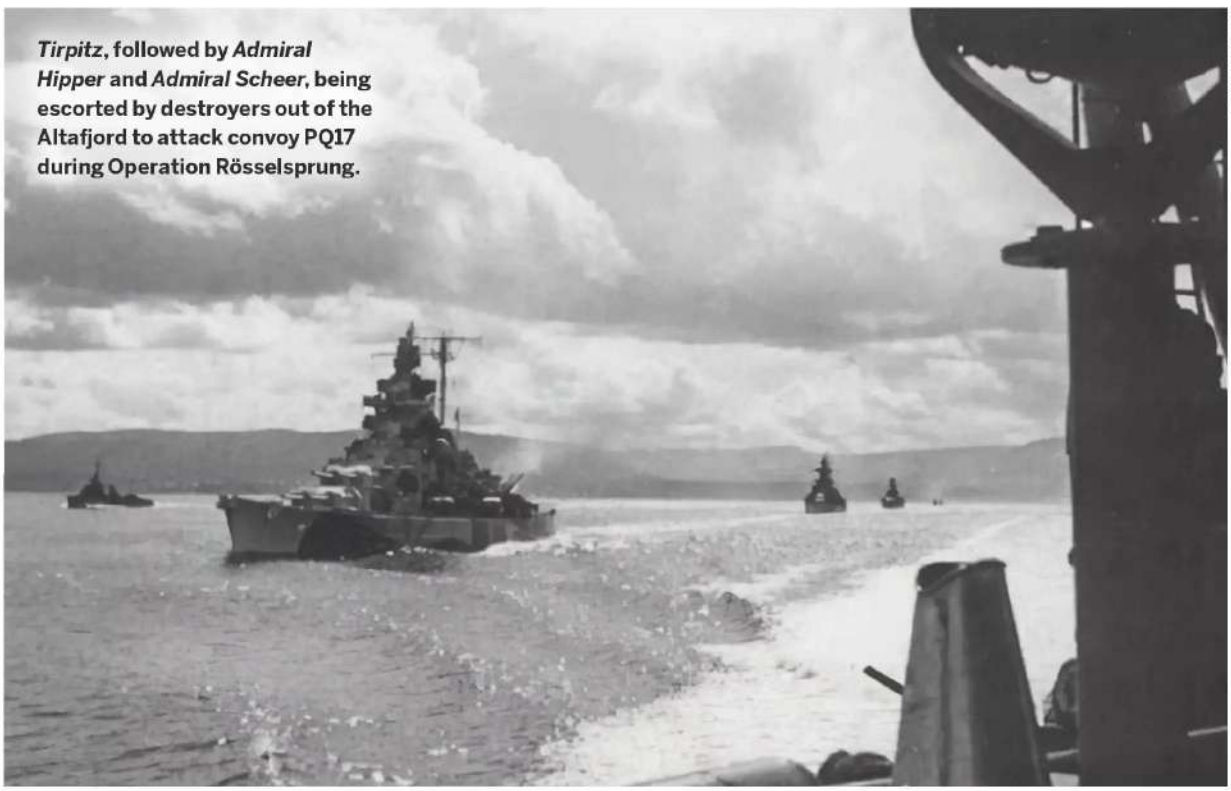
PQ17 HAD LEFT Iceland on 27th June with 36 merchant ships. By the time the dispersal order arrived, one had turned back and three had been sunk. Of the remaining 32, only 11 reached their destination. The rest were sunk by aircraft and submarines. Two-thirds of their valuable cargo went to the seabed, and 153 sailors and women died: blown up, burned, drowned or frozen. Ironically, *Tirpitz* was in many ways to blame, even though she never came close to the convoy.

When the dispersal order was sent, *Tirpitz* was at anchor, but not where she usually was. She'd left Fættenfjord on the evening of 2nd July with orders to conduct Operation Rösselsprung, an attack on convoy PQ17. During 4th July, a strong squadron assembled in Altafjord in Northern Norway. That evening, Pound received intelligence on *Tirpitz*'s movements. Aerial reconnaissance had lost her. When he realised that she could theoretically intercept PQ17 on the morning of 5th July, he panicked. Although there was no concrete evidence that *Tirpitz* had gone to sea, he ordered PQ17 to disperse.

In fact, both Hitler and Raeder were reluctant to risk *Tirpitz* in the operation. Only a report that the Home Fleet was too far away to intervene in time made them dare risk *Tirpitz*. At noon on 5th June, Raeder gave his orders. Accompanied by two heavy cruisers and seven destroyers, *Tirpitz* set off towards the convoy. It seemed that the day when the battleship and her crew would finally be able to contribute to the war was at hand.

But no. First a British reconnaissance plane, then a submarine spotted her. German signals intelligence intercepted their reports. The risk to *Tirpitz* was not really that great, but it was too great for Raeder. At 21.00 he gave the order to cancel Rösselsprung. *Tirpitz* had been thwarted yet again. Nevertheless, it was her threat that prompted Pound to disperse PQ17, allowing German aircraft and submarines to sink many times the number of ships they'd have otherwise been able to.

TIRPITZ FINALLY RETURNED to Fættenfjord on 24th October. By then, the British already had a plan to attack her there: Operation Title. It involved smuggling in two Chariot torpedoes – underwater devices almost seven metres long, each manned by two frogmen – with crews from a Norwegian trawler aided by the Norwegian resistance. Near *Tirpitz*, they would then sneak up and attach magnetic warheads to her hull. The risks were staggering. Much could go wrong. And sure enough, on the evening of 30th October, the trawler was only 16 km from *Tirpitz* when both torpedoes were torn from their tow cables



Tirpitz, followed by _Admiral Hipper_ and _Admiral Scheer_, being escorted by destroyers out of the Altafjord to attack convoy PQ17 during Operation Rösselsprung.

HISTORIE ARCHIVE

in a sudden storm. The participants had to flee across the border to Sweden. During the escape, sailor Bob Evans was wounded and taken prisoner. He was shot as a saboteur in Oslo on 19th January 1943, aged 20. From her anchorage, *Tirpitz* had devoured another human life – and as usual, by doing nothing other than simply being there.

For once, there were no direct British plans for a new attack, and ironically, *Tirpitz*'s career was coming to an end anyway – not because of the Royal Navy or Bomber Command, but because of Hitler. On New Year's Eve 1942, a German squadron made an unsuccessful raid on convoy JW51B in the Barents Sea. This was the final straw for Hitler. He'd had enough of his resource-hungry heavy ships and decided to scrap them. Raeder resigned in protest. Karl Dönitz became the new fleet commander and managed to get Hitler to back down. *Tirpitz* thus remained a fleet in being.

Trapped as they were in their iron castle, *Tirpitz* crew lived well; food was plentiful, leisure time varied, risks low. Yet frustration was spreading through the ranks. The men wanted to go into battle, to do something in the great war other than perform exercises and drills. And one day in the autumn of 1943, *Tirpitz* actually left her den. "Our excitement ran high," one crew member recalled. However, the purpose of the voyage was anything but glorious: to knock out a weather station on Spitsbergen, manned by a hundred exiled Norwegians. At least *Tirpitz* got to fire her mighty 38s at targets such as sheds, coal stores and oil depots. The crew was satisfied that they had at least done something, an illusion naval command maintained by awarding every sixth man the Iron Cross for bravery during the raid on the weather station. Perhaps the crew would have celebrated less if they had known that *Tirpitz* had just completed her last real mission.

KAAFJORD, 22ND SEPTEMBER 1943. *Tirpitz* was ready to sail. An hour earlier, a mini submarine was discovered next to the ship. It was vital to get the battleship away from her anchorage in case the mini sub had laid explosive charges. She finally started to move – but too slowly, and too late. The clock struck 08.12. Eight tonnes of amatol exploded. The whole battleship 'bounced', almost lifted out of the water. Men were tossed around like dolls, breaking bones, cracking skulls. Deck plating was torn up, pipes bent, glass shattered. The ship's power was knocked out. And tonnes of water poured in through a six-metre crack in the bottom of the battleship. The British had ▶



The Chariot torpedo was manned by two frogmen who delivered the warhead directly to the enemy ship.

IMPERIAL WAR MUSEUMS

HUNTING TIRPITZ



***Tirpitz* is surrounded by submarine nets in Kaafjord at the end of March 1943.**

MICHAEL PODOCK

finally wounded *Tirpitz* – and wounded her badly. Churchill had not been one to give up easily. After Operation Title's failure, he chastised the Admiralty, Bomber Command and Combined Operations. "It is a terrible thing that this prize should be waiting and no one able to think of a way of winning it," he wrote in a note in February 1943. By then, the Royal Navy had already begun planning a new attack with an entirely new weapon: X-Craft mini submarines. The steel cigars – barely 16 metres long – were desperately slow and unbelievably cramped. But each could carry two enormous explosive charges.

The mission was named Operation Source. The battleship *Scharnhorst* and heavy cruiser *Lützow* were also on the target list. After endless training and meticulous preparation, six submarines, each with an X-Craft in tow, left their Scottish base on the afternoon of 11th September. The journey across the North Atlantic, 15 metres below sea level, was arduous. One X-Craft sank with all hands, a second was damaged and had to be scuttled, a third proved unable to fulfil its part of the operation due to mechanical problems. In the end, only the attack on *Tirpitz* could be carried out. Submarines *X-6* and *X-7* managed to get past both booms and torpedo nets undetected and lay their explosive charges under the battleship. *X-5* developed a fault and was scuttled shortly after the explosions. The operation cost nine British sailors their lives, as well as one German and one Norwegian civilian who were accidentally shot by trigger-happy German sailors.

Tirpitz was badly hit. Worst of all, her engine and propeller shafts were so badly damaged that the wounded ship couldn't move under her own power. Towing her to a shipyard in Germany would be like a street race. Dönitz and Hitler decided that the repairs would be done on site. A wholly unsuccessful raid by Soviet bombers failed to disrupt the work and by mid-March 1944, she was operational again. By this time, *Tirpitz* was the only heavy ship in the German navy that wasn't either trapped in the Baltic or resting on the seabed.

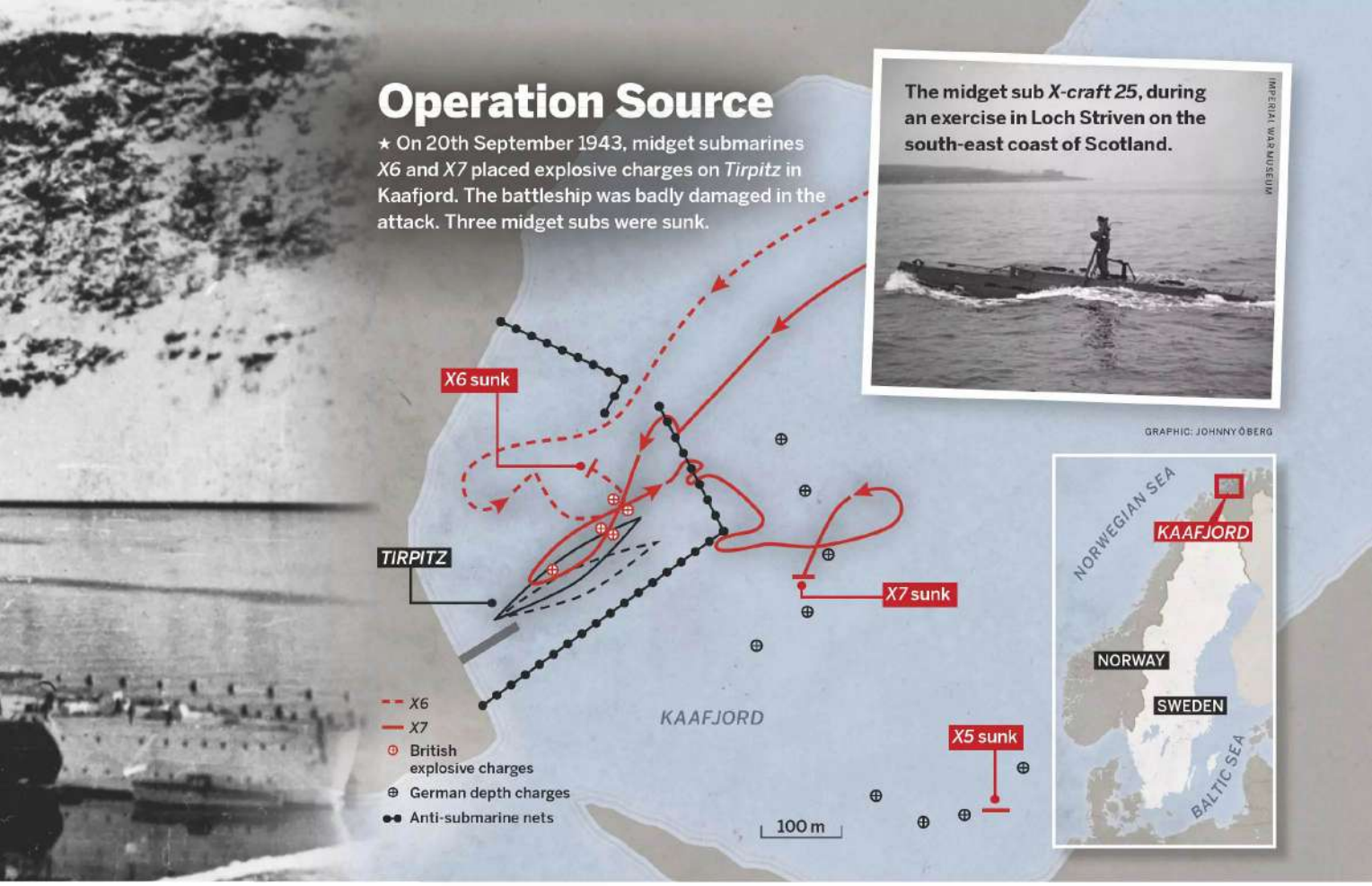
The Allies had effectively won the Battle of the Atlantic. But Churchill and the Admiralty were far from finished with *Tirpitz*. Had they not been so enchanted by her, they would have realised that the Germans were unlikely to risk her on the high seas. Instead, as early as December 1943, London began making new plans to get rid of her. The Navy couldn't get near her, Bomber Command wasn't interested. The task went to the Navy's Fleet Air Arm.



IMPERIAL WAR MUSEUM

A crewman from the Fleet Air Arm of HMS *Furious* writes a message on his bomb before a raid on *Tirpitz* in Kaafjord.

KAAFJORD, 3RD APRIL 1944. *Tirpitz* had finally taken to the sea again on a sunny and clear winter morning. It was time to carry out speed tests after



months of repairs. The deck was packed with crew. Suddenly they appeared in the sky: long-nosed dive bombers and small fighter-bombers. The air raid alarm began to sound. The crew rushed to their stations, but it was too late. The fighter planes dived down towards the behemoth, guns blazing. It was a slaughter of all the unprotected men on deck. Then came the bombs, howling from the sky. One strike after another: AP (armour-piercing) and SAP (semi-armour-piercing) bombs, high-explosive and anti-submarine bombs, all exploded along the ship. It was over in two minutes. *Tirpitz* lay wreathed in smoke and artificial fog with a bloody deck and gaping holes.

Operation Tungsten was the Fleet Air Arm's first attack on *Tirpitz* in over two years. The Royal Navy's aircraft carriers were finally equipped with effective aircraft. There was a new 725-kg armour-piercing bomb that raised high hopes. The operation proved successful in multiple ways. Twelve bombs hit the ship. Above the armoured deck, the damage was extensive. One hundred and twenty-two crew members were killed and 316 wounded. That evening, the Admiralty received its first report: "It is certain that *Tirpitz* is badly hit by first strike." The Norwegian king sent congratulations to the fleet, Churchill grinned, the press celebrated.

But the roar of victory soon died in their throats. No bombs had punched through *Tirpitz*'s armoured

"THE OPERATION COST NINE BRITISH SAILORS THEIR LIVES"

deck, not even the new 725-kg ones. The damage was superficial. The carriers went out again with all their escorts, spring became summer, operation followed operation: Planet, Brawn, Tiger Claw, Mascot, Goodwood I-IV. It was as if it was a done deal. Unless the weather cancelled the operation, the Germans were forewarned, and the battleship was enveloped in smoke from its annoying fog machines. During Goodwood III, two bombs actually hit her – without doing much damage. In all, from Tungsten to Goodwood IV, the attacks cost the Royal Navy 17 aircraft and 40 aircrew. On top of that, an escort carrier and a corvette were torpedoed by a German U-boat. Both ships were lost and 59 sailors were killed. And when August 1944 came to an end, *Tirpitz* remained in Kaafjord.

HÅKØYA, 12TH NOVEMBER 1944. Ensign Alfred Zuba was reading a book on German history when the air raid siren went off. He was in the gunnery fire control section, far below decks, but immediately knew what it was: Lancaster bombers with earthquake bombs. Soon the reports came ▶

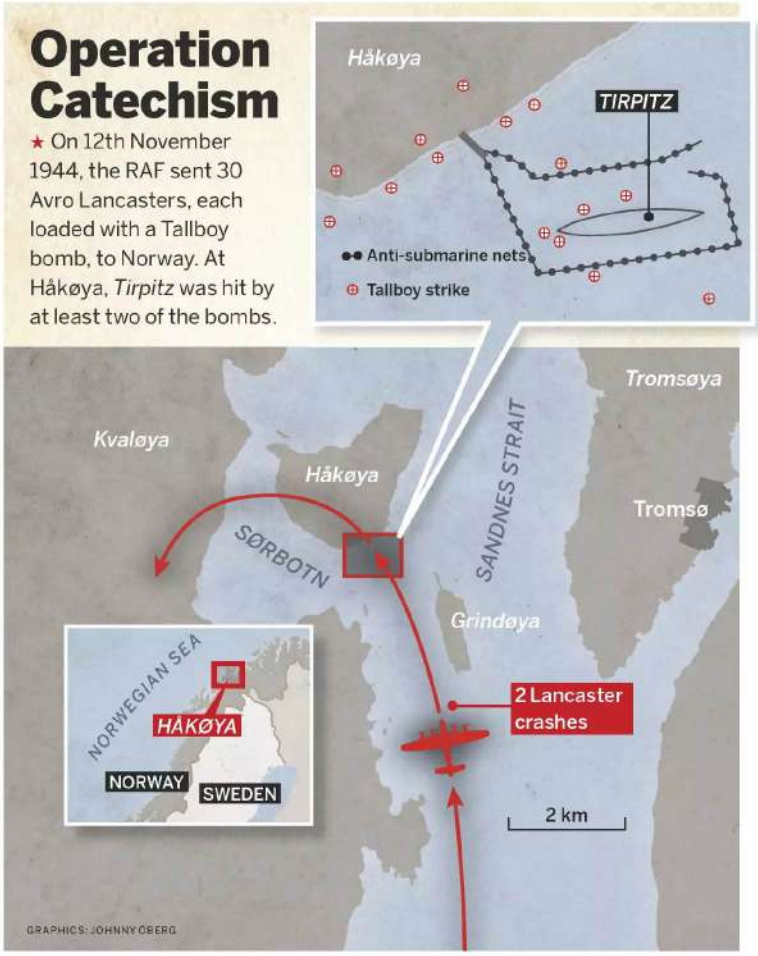
▶ blaring through his headphones. Altitude: 2,700 metres. When they were still 20 km distant, *Tirpitz* opened fire with her main artillery. The whole ship vibrated with the power of the guns firing off their nearly one-tonne shells. The lighter guns begin to clatter. Then the first bombs fell.

The explosions were deafening. The ship shook and started to list. The lights went out as more bombs fell. *Tirpitz* convulsed. Zuba and his comrades in the fire control section fled. They were four decks down and water was rushing into the darkness. They hadn't gone far when *Tirpitz* lurched heavily and lay on her side. Zuba found himself hanging from a pipe over dark, oily water. He felt his grip loosen amid the thought that it would be all over in a few minutes. Then *Tirpitz* managed one last heave, rolling over on to her back, bottom up. When the roof became the floor, Zuba was able to stand on some pipes. He was still alive, but like hundreds of others, he was now trapped in the interior of the sinking ship.

AFTER THE FLEET Air Arm's failure, the task of sinking *Tirpitz* reverted to Bomber Command. Much

Operation Catechism

★ On 12th November 1944, the RAF sent 30 Avro Lancasters, each loaded with a Tallboy bomb, to Norway. At Håkøya, *Tirpitz* was hit by at least two of the bombs.



"A POORLY PATCHED-UP TIRPITZ BEGAN HER FINAL VOYAGE"

had happened since the unit's first impotent attack in the summer of 1941. Bomber Command was now a vast apparatus of destruction; aircraft, bombers, navigation equipment, bombsights and crews were so good in 1944 that the unit could wipe out a medium-sized German city in a single raid. Most importantly, there was now a bomb capable of penetrating *Tirpitz*'s armoured deck, the Tallboy earthquake bomb.

The operation was named Paravane. The Lancaster bomber was the only aircraft capable of carrying a Tallboy, but wasn't capable of flying to Kaafjord and back from the UK, so the entire strike force had to be flown to a Soviet airbase first. Bad weather resulted in six Lancasters losing their bearings and crash-landing. Finally, on 15th September, at least 27 Lancasters were able to set off for Kaafjord, armed with either Tallboys or another unusual British invention, the Highball, a bouncing mine. As usual, *Tirpitz* was obscured by fog from land-based smoke generators; as so often in the past, bombs had to be dropped at random. The mines were a flop. The lone Tallboy bomb that hit was not.

It went straight through *Tirpitz* and exploded beneath her. The force of the blast completely destroyed her bow. She was no longer seaworthy. On 23rd September, Dönitz gathered his staff in Berlin to decide the battleship's fate. Moving her to Germany was not an option; repairing her in situ would take an estimated nine months; and in any case, it looked like the Germans would soon have to flee Northern Norway from the Soviet army's advances. The only role that could be devised for her was to move her south to Tromsø, where she could serve as a floating battery on the day of the Red Army's advance and continue to be a fleet in being.

ON 15TH OCTOBER, a poorly patched-up *Tirpitz* began her final voyage. The next day she anchored at Håkøya, with no protective mountains around her and no fog generators. The crew realised what was happening. The talk on deck was that they were now on "a mission to heaven". A few days later, British aerial reconnaissance found her. By then, Allied intelligence had learnt that *Tirpitz* was no longer a threat. But that didn't matter any more. After five years of total war, after five years of costly hunting, both Churchill and the Admiralty wanted blood.

The move to Håkøya brought the *Tirpitz* so close to Bomber Command's bases in the UK that Lancaster aircraft could reach her – if you removed

IMPERIAL WAR MUSEUM

A Lancaster bomber about to drop a Tallboy bomb during Operation Paravane. The Germans' attempt to cover *Tirpitz* in smoke is clearly visible.



Tallboy was 6.4 metres high and weighed 5,448 kilograms. If dropped from 5,500 metres, it hit its target at a speed of 1,200 km/h.

the cockpit armour, all the machine guns and their ammunition, upgraded the engines and brought extra fuel on board. So that's what the British did. In the middle of the night on 29th October, 37 modified Lancasters took off on Operation Obviate. When the force reached *Tirpitz* at 08.00 the following morning, the crews watched helplessly as thick clouds swept in from the west, just a minute before the first planes reached their target. They had to randomly drop their bombs – not one of them hit. The outcome of the operation was one Lancaster shot down – its crew was imprisoned in Sweden – versus damage to *Tirpitz*'s port propeller shaft and rudder from a near miss.

Both *Tirpitz*'s crew and Bomber Command's chosen battleship hunters realised that it was only a matter of time before they all had to go through the whole process again. Indeed, after midnight on 12th November, 32 Lancasters took off once more to fly the long, cold miles to Håkøya. This time the operation was called Catechism. Over the target, visibility was "gin clear" according to one pilot. No smoke or clouds protected her, the anti-aircraft defence was ineffective. For eight minutes, Tallboys rained down. Two of them broke through the armoured deck and exploded deep inside the battleship. She began to capsize – then one of the munitions exploded. *Tirpitz* flipped over and lay on her back, the bottom of her rust-coloured hull now visible above the surface.

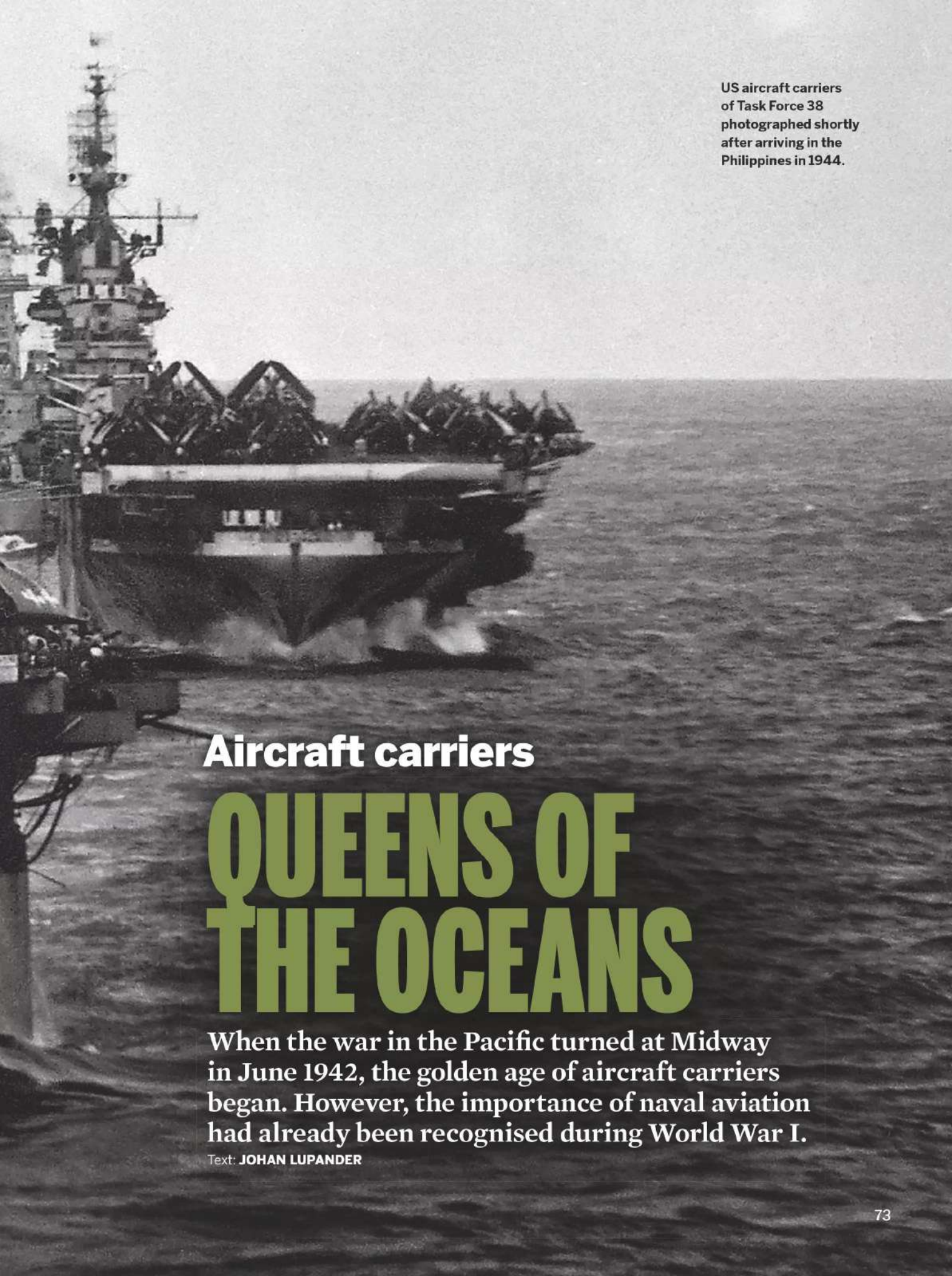
THE SAGA OF *Tirpitz* was over. As it was for 971 of her crew, whose lives ended that day. Only 87 of all the men trapped inside the ship's hull were rescued. Alfred Zuba was one of them. In Britain, crews barely had time to land before the celebrations began. Churchill immediately congratulated the Air Ministry. The next day, the success filled the front pages and editorials of the newspapers.

In retrospect, it doesn't seem like much of a victory. The war was already over. *Tirpitz* had hardly been capable of doing any significant damage since the summer of 1943 and certainly not after 3rd April 1944. She was irrelevant. But war brings its own logic. After endless hours of training and planning, after over a thousand bombing missions, the Operations Saint-Nazaire, Title and Source, after all the planes shot down and ships sacrificed, after all the dead, wounded and prisoners of war, the government, led by Churchill himself, was not prepared to show *Tirpitz* any mercy. When she rolled over on her back on 12th November 1944, it was little more than an empty propaganda victory – and a suitably ironic end to a ship that led a very strange career.

Magnus Olofsson is a historian.



NATIONAL ARCHIVES AND RECORDS ADMINISTRATION



US aircraft carriers of Task Force 38 photographed shortly after arriving in the Philippines in 1944.

Aircraft carriers

QUEENS OF THE OCEANS

When the war in the Pacific turned at Midway in June 1942, the golden age of aircraft carriers began. However, the importance of naval aviation had already been recognised during World War I.

Text: **JOHAN LUPANDER**



A Grumman F6F Hellcat fighter is lifted up to the flight deck of the USS *Yorktown* (CV-10) via the aft lift. 1944 or 1945.

NATIONAL MUSEUM OF NAVAL AVIATION

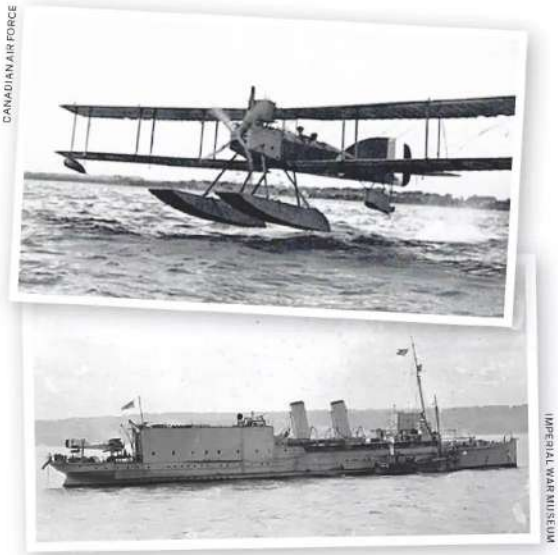
On 4th June 1942 at 10.20, northwest of the small island of Midway in the North Pacific, nearly 50 US dive bombers attacked a Japanese carrier force. The aircraft carrier *Kaga* was hit by a 227-kilogram bomb that struck the flight deck. After the bomb penetrated the deck and entered the hangar space below, its 90 kg of explosives detonated. The tightly packed aircraft, full of fuel and loaded with armed torpedoes, were showered with glowing shrapnel. The crew was thrown around below deck, pierced by shards of metal or crushed by debris. The area near the bomb bay became a sea of fire that spread throughout the hangar space, where the warheads of the aircraft torpedoes began to explode in the heat, tearing apart the upper parts of the ship. Within minutes, the *Kaga* had been destroyed by the US bombs and engulfed in flames as the wreckage plunged below the waves.

"AS EARLY AS 1914, THERE WERE CARRIERS WITH HANGARS FOR SEAPLANES"

Altitude has always been an advantage in the military. First and foremost, it has provided a greater field of view, but it is also easier to move downhill and, conversely, more difficult to go uphill. Mountains, hills and ridges were dealt with by hot-air balloons and airships when developments made this practical.

The first known use of technical aids was a French hot-air balloon used for observation during the Battle of Fleurus (now Belgium) in 1794. In naval warfare, these innovations were soon adopted and adapted, and some would remain for some time.

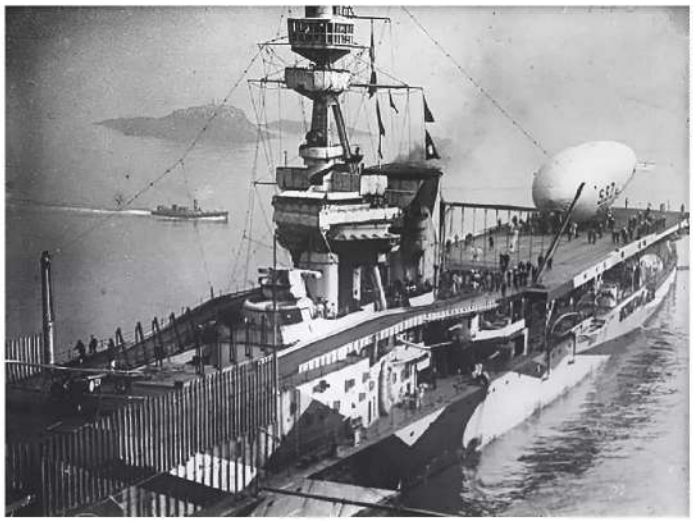
ONCE IT STARTED at the beginning of the 20th century, the development of aircraft carriers proceeded rapidly. As early as 1914, there were special aircraft carriers with hangars for several seaplanes, which took off and landed on the water, from where they were lifted back on to the ship by crane. In December 1914, the German naval base at



CANADIAN AIR FORCE

IMPERIAL WAR MUSEUM

The British seaplane Short 184 (top) took off and landed from the water. Bottom, the depot ship HMS *Engadine*.



IMPERIAL WAR MUSEUM

The British battlecruiser HMS *Furious* was launched in 1916 but was soon refitted to include a flight deck at the front and one at the rear, connected by two narrow runways.

Cuxhaven was attacked with 9-kg bombs by British seaplanes launched from three such depot ships, which had transported them across the North Sea within range of their target. In August 1915, British Short 184 aircraft made the first successful airborne torpedo attacks on Turkish ships in the Dardanelles.

This particular type of plane could have played a decisive role in the Battle of Jutland in May 1916, but its depot ship, HMS *Engadine*, only received orders to launch one of its four aircraft. Inexplicably, this plane was given a reconnaissance mission to the north-east, when the most likely direction of the appearance of German heavy ships was from the south-east. Nothing should have prevented several of *Engadine's* planes being deployed in this direction, detecting the entire German fleet and providing the British admirals with invaluable information about the enemy in good time by radio.

THE DISADVANTAGES OF planes taking off from the surface of the sea were already apparent, and attempts were made to change the situation. A depot ship was fitted with a 75-metre-long track on the foredeck for a trolley carrying a seaplane, and when the ship headed into the wind at top speed (20 knots), the plane could take off from the ship itself. Take-off and landing by wheeled aircraft on stationary ships had been tried in the United States in around 1911. The British battlecruiser *Furious* was rebuilt in a couple of stages so that she had ▶

SBD Dauntless dive bomber moving forward for take-off on USS *Saratoga* (CV-3), 1941.



NAVAL HISTORY AND HERITAGE COMMAND

► short flight decks over both the bow and stern, with narrow runways between them.

It was on her foredeck that the first successful landing of a wheeled plane on a moving ship was made in August 1917. On the next attempt, the plane crashed and the pilot was killed. The aft deck was unusable for landings because of air turbulence caused by the ship's superstructure.

Despite this, *Furious* formed the first carrier strike operation, carried out on 19th July 1918 against the German airship base at Tönder (in present-day Denmark). Two airships were destroyed, but of the seven British aircraft involved, one crashed into the sea during its approach and one disappeared without trace. Five completed the mission, with three making emergency landings in Denmark and two returning to *Furious*, where they made emergency landings on the water. At the end of the war, Britain was the only country to have aircraft carriers (two), but Japan and the US followed suit over the next few years.

Using battleship hulls freed up by the 1922 Washington Naval Treaty on armaments limitation, Britain, the United States and Japan built a number of large aircraft carriers. There were also new builds of smaller ships, with varying results, one of which, HMS *Argus*, was described by contemporaries as "a small grey dismasted hulk, on fire aft" or "a wreck, floating bottom up".

THE 1920S SAW wild variations in the organisation of aircraft and carrier forces, a process that continued into the 1930s. A range of aircraft designs also emerged in response to the practical requirements of aircraft carrier operations. Many verged on the ridiculous and did not last long. To increase the flexibility of take-offs, some US carriers until the 1940s had a catapult that could transversely launch aircraft directly from the hangar deck. It's easy to imagine the problems of crosswinds during flight. In Britain, the consequence of rivalries between the various branches of the military was that the Royal Navy's aviation was managed, organised and manned by themselves, while a less than enthusiastic Royal Air Force was responsible for procuring the aircraft.



Blackburn Skua.

HISTORIE ARCHIVE

To save money, aircraft types were developed to fulfil such a wide variety of tasks that they were virtually useless for all of them. For example, the British Blackburn Skua was intended to serve as both a fighter and a dive bomber. The result was that it was too slow and poorly armed to be a fighter and too small to carry a sufficient bomb load in its other role. This monoplane had the dubious distinction of being replaced as a dive bomber by the Fairey Albacore biplane.

The rearmament of the 1930s resulted in new carriers – where the experience of previous years was put into practice – and more new aircraft. The aircraft carriers that emerged in the period 1936-40 were impressive creations, well over 200 metres long and with a displacement of 20,000-25,000 tonnes. They had room for 50-80 planes.

AT THE OUTBREAK of war in 1939, some 20 aircraft carriers were in the service of the major naval powers, the United States, Great Britain and Japan. Another half dozen were completed during the first years of the war.

The principles by which different powers constructed their aircraft carriers varied. The Americans and Japanese prioritised combat power by maximising the number of planes at the expense of deck armour and underwater protection. The British, on the other hand, favoured armoured protection at the expense of aircraft numbers.

At the top of the ships was the flight deck (see illustration on the next page), on which the aircraft took off and landed. Below this was the hangar deck, sometimes several storeys high. Here the planes and their engines were checked, overhauled and repaired. Before flying, the aircraft could be refuelled, armed and set up on the hangar deck in the order required



USS *Yorktown* is hit by torpedoes on the port side on 4th June 1942.

US NAVY



A Douglas SBD-3 Dauntless dive bomber is fitted with a 1,000-pound bomb aboard USS *Ranger* (CV-4). November 1942.

NAVAL HISTORY AND HERITAGE COMMAND

for the mission. They were then lifted to the flight deck by one of the large lifts. The ceiling height in the hangar space could exceed five metres and allowed reserve aircraft to be suspended from the ceiling.

Deep down in the carriers were ammunition stores filled with bombs and torpedoes, as well as tanks of high-octane aviation fuel. Many hundreds of tonnes of explosive and/or flammable substances were involved. Ship designers tried to protect these floating ammunition and fuel depots as best they could. Deck armour, which was usually integrated into the hangar deck, could protect against bombs.

To prevent, contain and fight fires, there was equipment for filling the aviation fuel system with carbon dioxide and dropping fire curtains on the hangar deck. This was complemented by valve systems to fill the ammunition stores with water, and apparatus and pipework to extinguish fires with foam, carbon dioxide and water. Despite all these protective measures, wartime experience would reveal that aircraft carriers could be embarrassingly vulnerable, especially to torpedoes. Even modern ships such as the British *Ark Royal* and the Japanese *Taiho* were sunk by a single such hit.

PLANES COULD OPERATE from aircraft carriers because the ship could travel into the wind at high speed, perhaps more than 30 knots. Thanks to this headwind, the planes could take off over 75-150 metres. On landing, the planes were lighter (because the weapons load had been removed and fuel consumed) and could therefore fly more slowly. They were stopped quickly when the aircraft's tailhook was caught by one of the cables – up to 14 of them – stretched across the flight deck. The deceleration was less severe than the sudden braking of a modern car.

"IN 1939, 20 CARRIERS WERE IN THE SERVICE OF THE MAJOR NAVAL POWERS"

If the take-off of individual aircraft was a technical matter, it became even more complicated when entire airborne units had to take off. The requirement that this be done as quickly and simultaneously as possible became very difficult to fulfil if there were several units with different types of aircraft. The planes could take off at very short intervals – every ten seconds, say. But if anything interfered with the take-off procedure,

Article continues on page 80 ▶

USS ENTERPRISE

The aircraft carrier USS *Enterprise* participated in more battles against Japan than any other US ship during World War II. She also received the most battle star awards – 20. This is what she looked like at the time of the Battle of Midway in June 1942.



Guns Two 12.7-cm general purpose guns.



Flight deck Stretched the entire length of the ship. Here an SBD Dauntless dive bomber is prepared for take-off on the *Enterprise* flight deck. February 1942.

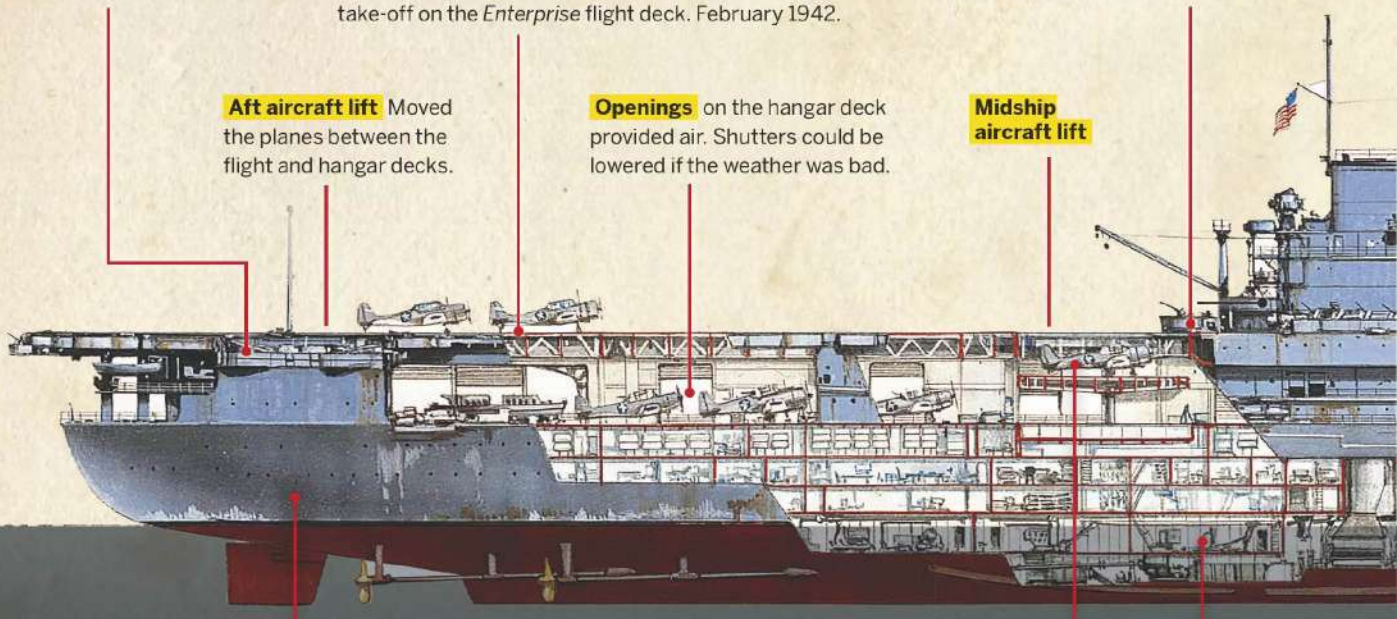


Air defence Two four-barrelled 28-mm anti-aircraft guns.

Aft aircraft lift Moved the planes between the flight and hangar decks.

Openings on the hangar deck provided air. Shutters could be lowered if the weather was bad.

Midship aircraft lift



Lower decks Below the hangar deck were several decks with workshops, stores, storage areas and so on. At the bottom were the ammunition stores (bombs and torpedoes) and fuel oil and aviation fuel tanks.



A Douglas TBD Devastator torpedo plane is transported via the aircraft lift between the flight and hangar decks of *Enterprise*. June 1942.

Steam turbines Four in four engine rooms.

ILLUSTRATION: CHRISTOFFER REHN



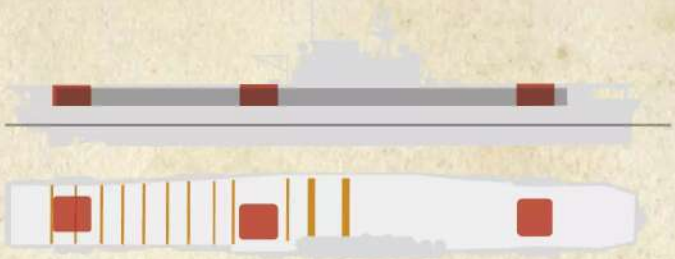
Two pilots on the *Enterprise* flight deck with their F6F Hellcat fighters. February 1944.

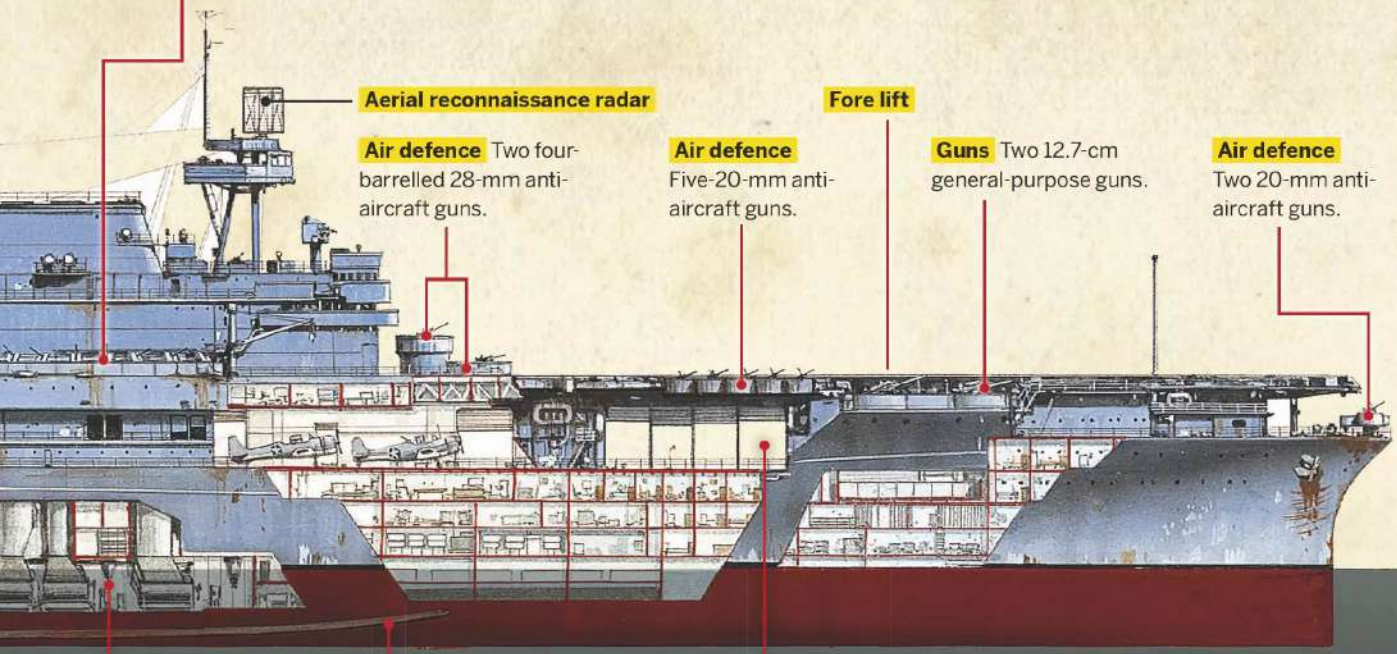
THE SHIP IN NUMBERS

Class: Yorktown.
Launched: 3rd October 1936.
In service: 12th May 1938 until 17th February 1947.
Displacement: 19,800-25,500 tonnes.
Length overall: 251.4 metres.
Maximum width: 33.4 metres.
Draught: 7.9 metres.
Speed: 32.5 knots (60.2 km/h).
Range: 12,500 nautical miles (23,200 km) at 15 knots.
Crew: 2,200.
Number of aircraft: 80.



Air defence Nine 20-mm anti-aircraft autocannons.





Aerial reconnaissance radar

Air defence Two four-barrelled 28-mm anti-aircraft guns.

Air defence Five-20-mm anti-aircraft guns.

Fore lift

Guns Two 12.7-cm general-purpose guns.

Air defence Two 20-mm anti-aircraft guns.

Steam boilers Nine in as many boiler rooms.

Keel An extended keel prevented rolling, which made it easier for aircraft to take off and land.





The aircraft were stored and serviced on the hangar deck. Here a Grumman F4F Wildcat fighter is getting a check-up. October 1941.



The second deckload of aircraft is lined up for take-off on the *Enterprise* flight deck on the morning of 4th June 1942. These 11 TBD Devastator torpedo planes would be supplemented by another four (one suffered engine failure) and by ten F4F Wildcat fighters.

► the aircraft that had already taken off had to wait longer than necessary, consuming precious fuel in the process.

For landings, the procedure was to some extent reversed. Here, the barrier nets that could be quickly deployed across the flight deck, about two-thirds of its length from the stern, played a central role. Their purpose was to intercept – more or less immediately, sometimes catastrophically – planes that had failed to land properly.

With a well-drilled crew, who ensured that landed aircraft were quickly released from the brake cable and driven over the temporarily lowered barriers, a plane could land every 20 seconds – when everything went as planned.

Landing procedures and methods were slightly different. The Americans and British relied on an experienced flight officer to direct the landings from a platform at the stern, using signal paddles. The Japanese, however, had developed a technical aid for pilots that was decades ahead of its time. This system of green and red lights showed the pilot of the landing aircraft how he was positioned in relation to the ideal path down to the flight deck.

In 1939, the Japanese Navy was the world leader in coordinated multi-carrier operations and the tactical use of air units. It had developed standard procedures for operating in coordination with several carriers and organising their air divisions into all-round attack units (both torpedo and dive bombers, with fighter escorts). The US and British navies only managed to make coordination work within a carrier air force, as well as between several aircraft carriers, later on in World War II.

"THANKS TO THIS HEADWIND, PLANES COULD TAKE OFF OVER 75-150 METRES"

THEREFORE, AFTER VARIOUS attempts to meet several requirements with only one type of aircraft, which were astonishing in their lack of practicality, some specialised types emerged:

- Fighter planes, which used machine guns and cannons to combat enemy aircraft, either in defence of their own ships or in escorting planes on missions.
- Reconnaissance aircraft, which flew as far as possible to detect enemy naval units at an early stage or to scout for targets on land.
- Bomber planes, which were used to combat enemy ships and land installations. It soon proved necessary to subdivide this group further:

– Torpedo planes, which were armed with torpedoes (bombs were available as an alternative

weapon and these were dropped in flight or in a moderately steep dive).
– Heavy bombers, which used a particularly difficult dive to drop bombs weighing up to almost a tonne.

IN THE EARLY stages of World War II, only Great Britain, the US and Japan had significant aircraft carrier holdings. It was therefore these countries' navies that would use them in various theatres of war, often with considerable success – although history also shows the flagrant misuse of this particular weapon.

In the early years of the war, large British aircraft carriers made valuable contributions:

- In the spring of 1940 off the coast of Norway, in an operation that nevertheless ended with the totally unnecessary loss of the aircraft carrier *Glorious* due to an incompetent, inexperienced commander.
- The pursuit of the German battleship *Bismarck* in May 1941, in which torpedo planes from the carrier *Ark Royal* scored a decisive torpedo hit.
- The night-time attack on the Italian battle fleet in Taranto harbour in November 1940 from the aircraft carrier *Illustrious*, in which 21 Swordfish torpedo planes managed to put three battleships out of action for some time.

THE WAR SPREAD to the Pacific with one of the most famous surprise attacks in history – the Japanese attack on the US naval base at Pearl Harbor (Hawaii) on the morning of 7th December 1941. From six aircraft carriers, 353 planes took off and carried out an attack that left four sunk and three damaged battleships, a couple of hundred destroyed aircraft, and devastated air bases.

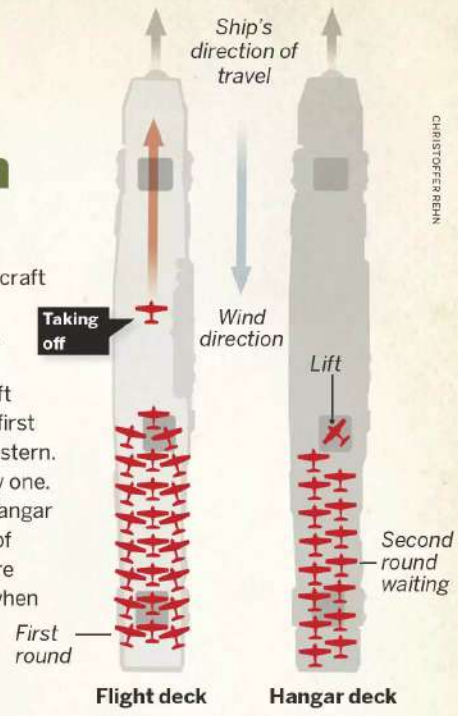
It was an attack of a type and scale that would not be equalled for years and is probably the best example in history of simultaneous political and military surprise. Yet it was a failure in several ways:

- Militarily, because the main targets of the attack – two US aircraft carriers – were at sea and thus escaped the attack.
- The attack left all of Pearl Harbor's basic resources such as dry docks, workshops and fuel depots untouched.
- Politically, because its malicious nature (there was no prior declaration of war) laid the foundation for the particularly bitter American attitude towards the Japanese during the war. Famously, US Admiral William Halsey said: *"Before we're through with them, the Japanese language will be spoken only in hell."*

IN EARLY MAY 1942, the first naval battle in history in which the combatants' ships never ▶

Take off every ten seconds

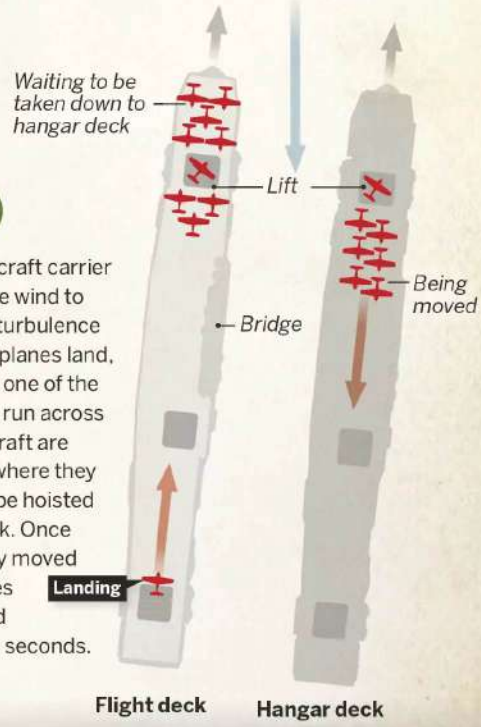
★ During take-off, the aircraft carrier moves against the direction of the wind, making it easier for the planes to take off. Aircraft waiting to take off in the first round are lined up at the stern. They then take off one by one. On the deck below, the hangar deck, the second round of planes is waiting. They are hoisted up and take off when the first round has left. If all goes well, planes can take off about every ten seconds.



CHRISTOFFER REHN

...and land every 20

★ When landing, the aircraft carrier is angled slightly into the wind to reduce the effect of air turbulence from the bridge. As the planes land, their tails are caught by one of the many brake cables that run across the flight deck. The aircraft are then rolled to the bow, where they are gathered to wait to be hoisted down to the hangar deck. Once there, they are gradually moved aft and parked. If all goes well, an aircraft can land approximately every 20 seconds.





An SBD Dauntless dive bomber lands on the deck of the USS *Ranger*. June 1942.

NAVAL HISTORY AND HERITAGE COMMAND



US DEFENSE IMAGERY

The 'ski-jump' enabled suitable planes to take off without catapult assistance. Here a British Sea Harrier FRS1 takes off from HMS *Invincible*.



ARCHIVE PHOTO

The angled deck was introduced in the mid-1950s. It made it possible to land (red arrow) while other planes took off, via catapult launches (orange arrow).

"JAPAN ENJOYED ALMOST UNBELIEVABLE SUCCESSES UNTIL MARCH 1942"

sighted each other took place – the Battle of the Coral Sea, east of Australia. It was fought with aircraft operating from US and Japanese aircraft carriers. The battle was a tactical success for the Japanese but a strategic victory for the Americans. The Japanese success was simply that they inflicted greater losses on the enemy than they suffered themselves. However, the Americans managed to fend off the threat of an invasion of the south coast of the island of New Guinea, which in turn would have given the Japanese a base to directly threaten Australia. For the first time, the Americans had succeeded in forcing the Japanese to suspend an ongoing offensive operation.

AFTER THE SURPRISE attack on the US naval base at Pearl Harbor, Japan enjoyed almost unbelievable successes until March 1942, taking control of a huge area. The Japanese military leadership then drew up plans for a further offensive eastwards across the Pacific. One objective was to conquer Midway, to threaten the Hawaiian Islands and US-Australian relations.

For the operations, the Japanese naval commander Admiral Yamamoto divided his fleet into four separate units. The most important of these was an aircraft carrier force – called *Kido Butai* – consisting of four carriers under the command of Vice-Admiral Nagumo. Its task was to support a landing on Midway and, if the opportunity arose, to engage US naval forces, particularly aircraft carriers.

In early May, US signals intelligence indicated that a Japanese offensive eastwards towards targets in the central Pacific was underway. Gradually, in what was one of the greatest intelligence achievements of World War II, a picture emerged of the operation's objective, its timing and the forces to be deployed.

Admiral Chester W Nimitz, commander of the Pacific Fleet, devised a plan that saw the US aircraft carriers grouped north-east of Midway, ready to counter either the Japanese carriers or a landing on the island.

When comparing the two naval forces, the Japanese numerical superiority appears overwhelming – 57 ships against 29. However, the Japanese units were spread over a large part of the North Pacific, and the forces that actually met in combat were fairly

Aircraft carrier fleets of major powers (numbers)

	USA				Great Britain				Japan			
	1939		1941		1939		1941		1939		1941	
	Built	Underway	Built	Underway	Built	Underway	Built	Underway	Built	Underway	Built	Underway
Heavy	4	1	5	3	5	6	5	2	4	3	6	1
Light	1	1	2	5	2	-	1	1	2	1	3	3
Total	**5**	**2**	**7**	**8**	**7**	**6**	**6**	**3**	**6**	**4**	**9**	**4**

At the beginning of WWII, only the United States, Great Britain and Japan had significant numbers of aircraft carriers.

Small carriers made big difference



Comparison between escort carriers and aircraft carriers.

★ Escort carriers lacked the obvious glamour of their big sisters as war-winning weapon systems, but offered a breadth of use that was just as important.

The early years of the war showed that the Royal Navy's methods and means of aircraft-based anti-submarine warfare were inadequate. Convoys needed their own air defence, against both submarines and bombers. After trying some almost panic-stricken emergency solutions with catapult-launched 'disposable fighters' on converted cargo ships, the British came up with the concept of the escort carrier in 1941 – a relatively small, fairly slow and cheap ship with a limited number of aircraft.

THE IDEA was taken up by the Americans. In the same year, a dozen escort carriers were built in the US. The country built 111 in total during the war for both its own and British needs – Britain itself built only a few.

The ships that emerged were only about 150 metres long, but still had all the essentials for air operations: space for 20-30 aircraft, two lifts to take the planes down to the hangar deck, and scant but adequate room below deck. The crews consisted mainly of newly enlisted conscripts, who in many cases had not even seen the sea when they signed up. The principles of flight operations were the same as for the large aircraft carriers, but things were complicated by the small size and low speed of escort carriers – just 19 knots.

FOR THE main task – finding and sinking submarines – torpedo and bomber aircraft were used, which were equipped with radar from 1944. For protection and as an aid when attacking submarines, older fighters were used.

In the Pacific, escort carriers were responsible for all the tasks that the large carriers could not perform – protection of convoys, anti-submarine warfare, liaison with land forces, air defence of landing areas, aircraft transport and so on. Enemy countermeasures were generally non-existent or limited to air defence. Operating from escort carriers in the Pacific therefore often became a one-sided war for the aircraft crews.

THAT WAS until early one morning – 25th October 1944, just east of the Philippines, where the Americans had just landed – when the lookouts of an escort carrier force saw the masts of the Japanese battle fleet rising above the horizon. This was the beginning of clashes in which the small carriers, their aircraft and their destroyer escorts rose to glory in one of the most unbalanced naval battles in history – the Battle of Samar.

Their epic effort caused the Japanese admiral's resolve to falter with only a few hours between him and the poorly protected American landing fleet, so he ordered the offensive to be cancelled.

This was truly the escort carriers' proudest moment. However, their life was short – the limited dimensions of the ships could not accommodate the demands of the jet age, and within ten years, they had all been scrapped or converted into cargo ships.



HISTORIE ARCHIVE

The British escort carrier HMS *Searcher* operated in the North Atlantic and Arctic Ocean, where rough seas were common.



Akagi was one of four Japanese aircraft carriers involved in the Battle of Midway. April 1942.

KURE MARITIME MUSEUM

"NAVAL WARFARE BETWEEN AIRCRAFT CARRIERS WAS SHORT-LIVED"



HISTORIE ARCHIVE

An SBD Dauntless drops a bomb. The aircraft type was highly successful, including sinking four Japanese aircraft carriers at Midway.

► evenly matched, especially in the crucial aspect of aircraft. The names of the participating carriers have become part of history:

- Japanese: *Akagi*, *Kaga*, *Hiryu* and *Soryu* (the light carrier did not participate).
- US: *Enterprise*, *Yorktown* and *Hornet*.

WITHIN SIX MONTHS of Midway, two more major battles were fought between carrier fleets, definitively confirming the aircraft carrier as the new queen of naval warfare. The battleship was now reduced to a secondary role. The operations against Midway and the Aleutian Islands in June 1942 were Japan's last significant strategic offensive operations of the Pacific War. Japanese naval aviation and its aircraft carriers continued to be used for counter-attacks under increasingly unfavourable conditions, and by October 1944 (the Battle of Cape Engaño), the remaining carriers had been demoted to the status of aircraftless dummy targets.

However, the phenomenon of naval warfare between aircraft carriers was historically short-lived. After the fighting in 1942, it was two years before further battles of this type took place. Probably the last battle in which carrier-based planes at sea attacked enemy aircraft carriers was fought in October 1944.

Technological development after World War II was intense, especially during the 1950s. A new angled deck allowed for simultaneous landings and steam-powered catapult launches. The steam catapult gave the new, heavy jets sufficient speed for take-off, while the landing gear facilitated the landing of fast planes. Work on the first nuclear-powered aircraft carrier also got underway.

For more than a decade after the end of the war in 1945, a number of countries – France, Canada, Brazil, Argentina, the Netherlands, Australia, India – each had one or two aircraft carriers of the smaller World War II model. When these ships began to reach their end of life, they were, with few exceptions, retired without being replaced.

The ability to afford to build new aircraft carriers and equip them with the necessary specialised aircraft was reserved for the major powers: the United States, the United Kingdom, France and eventually the Soviet Union and, most recently, China. The advent of vertical take-off jets and the somewhat revolutionary 'ski-jump' runway enabled the development of specialised smaller aircraft carriers. This made it possible for second-tier military powers, such as Spain and Italy, to have a ship-based jet component.

Since 1945, aircraft carriers have been actively deployed in several wars of various kinds: Korea, Suez, Aden, Vietnam, the Falklands, the Gulf War and Serbia. With few exceptions, the aircraft carriers in question have belonged to the US and British navies. A common denominator has been that the attacks were mainly directed against land and air targets.

IN 1982, HOWEVER, the picture almost changed. During the Falklands War between Argentina and Britain, the Royal Navy utilised its two remaining aircraft carriers, *Invincible* and *Hermes*. The Argentine aircraft carrier *Veinticinco de Mayo* was deployed to attack the British ships after receiving intelligence about their position. The plan was to attack with eight Skyhawk aircraft at dawn on 2nd May. However, the operation was cancelled due to low wind.

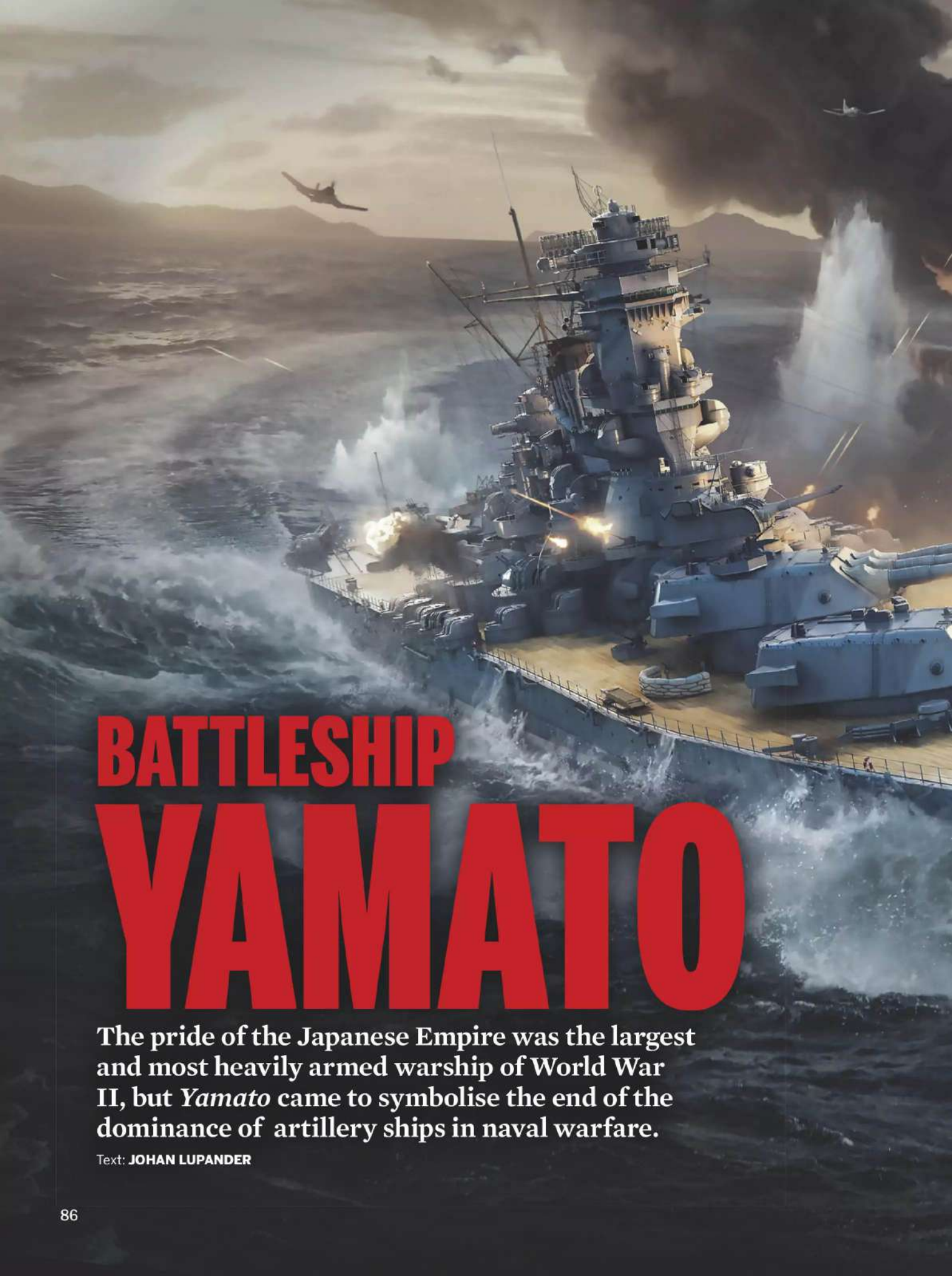
The aircraft carrier has remained a vital tool for the only remaining superpower, the United States. From nuclear-powered aircraft carriers, some four times larger than their World War II counterparts, it is now possible to deploy air combat forces at short notice almost anywhere in the world.

Johan Lupander is a military history writer.

★ TIP

Get on board!

A total of five aircraft carriers have been preserved as museums in the USA. The most accessible for UK visitors is the USS *Intrepid*, located in New York harbour.



BATTLESHIP YAMATO

The pride of the Japanese Empire was the largest and most heavily armed warship of World War II, but *Yamato* came to symbolise the end of the dominance of artillery ships in naval warfare.

Text: **JOHAN LUPANDER**



Imagined illustration of the *Yamato* as she manoeuvres away from US dive-bombing attacks in the Leyte Gulf.

WORLD OF WARSHIPS. HTTPS://WORLDOFWARSHIPS.EU

BATTLESHIP YAMATO

Yamato and her sister ships were, until 1961, the largest warships ever built. They achieved iconic status in the Japanese Navy during their construction and met a widespread post-war need for a link to the ideals of Japan's imperial era. By virtue of their sheer size and unrivalled armament, they represented the culmination of artillery ships' domination of the seas that had lasted more than 500 years.



The ensign of the Imperial Japanese Navy.

Artillery ships – warships with guns as their main weapons – were first documented in 1338, when naval warfare was essentially limited to ramming and boarding. In the following centuries, shipbuilding and artillery technology developed to the point where cannons became the main means of combat. By the 19th century, battleships and battlecruisers had emerged as the main carriers of the heaviest guns. By the end of World War I, the relatively new means of warfare, the sea mine and torpedo, as well as their carrier, the submarine, had established themselves and would be of considerable importance in future naval wars.

The three dominant naval powers – Great Britain, the United States and Japan – had all experimented with basing aircraft on specially designed ships, but for a long time the prevailing view in naval circles was that domination of the seas would continue to be determined by artillery ships, led by battleships. This view resulted in most of the resources for new construction being directed towards heavy artillery ships.

FOR MANY YEARS, the development of new battleships was influenced by clauses limiting their weight and gun calibre in a 1922 disarmament treaty (the Washington Treaty) and its successors. However, several of the signatories secretly violated these clauses, not least Japan. It also withdrew from the agreement in its entirety in 1936, paving the way for the construction of new battleships, which had long been anticipated. Some key principles of this work had been that each individual ship should be superior to the strongest units of any potential opponent. No fewer than 23 proposals were on the drawing board in 1934-37. In the same year that design work was completed, two new battleships were ordered, with two more planned for 1939.

THE FIRST TWO were *Yamato* and her sister ship *Musashi*, while the third began as a battleship but was completed as the aircraft carrier *Shinano*, and construction of the fourth was cancelled in November 1941.

Much effort had been put into the design of *Yamato's* hull. The work was complicated by the strict restrictions on such things as draught, which

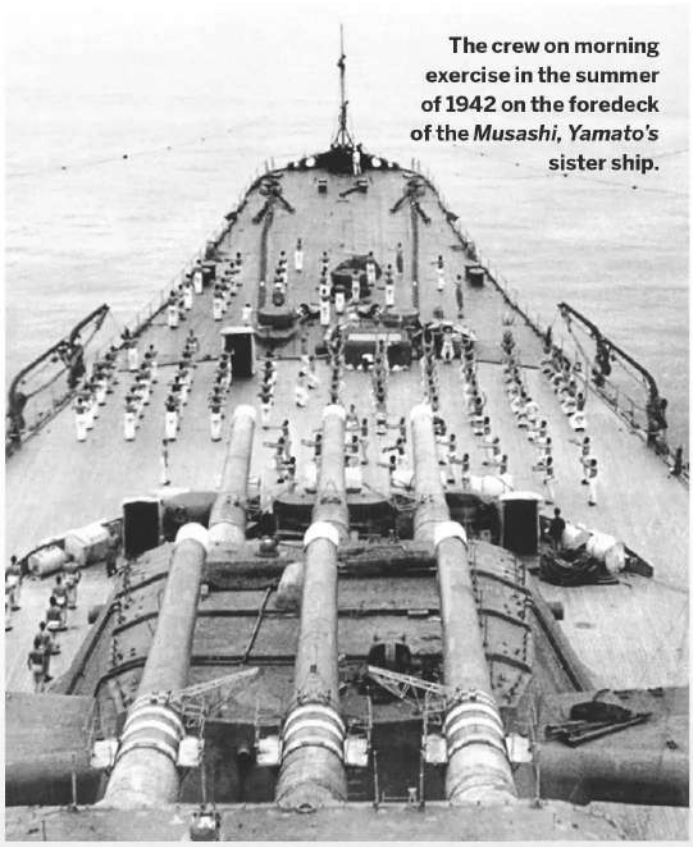


***Yamato* on a sea trial in the Bungo Strait off Sukumo on 20th October 1941.**

was determined by the dimensions of the available dry docks. Fifty different hull designs were tested in a 250-metre-long basin. Particular attention was paid to the hydrodynamic design of the underwater hull. By building a bulbous bow (hitherto found only on a few fast passenger ships), mounting the hull plates close together rather than overlapping in areas subject to a turbulent boundary layer, and carefully designing the propeller and rudder systems, it was possible to reduce the hull's water resistance at full speed by as much as 10 per cent.

PROPULSION WAS BASED on four steam turbines supplied by 12 boilers. The basic specifications were fairly conservative, with a working pressure of 25 atmospheres (atm), compared to the American *Iowa's* 41 atm and the German *Bismarck's* 56 atm. This meant that *Yamato's* machinery was relatively heavy and space-consuming, which in turn affected both the layout of the engine rooms and the design of the torpedo defence system.

Yamato has rightly become famous because of her main artillery. With a 460-mm calibre, these guns were the heaviest ever mounted on a warship. The closest is the British 18-inch gun the 18"/40 Mk I (temporarily installed on a battlecruiser and on three monitor ships in 1917-18), which had a slightly smaller calibre of 457 mm. A gun's performance is largely dependent on its ▶



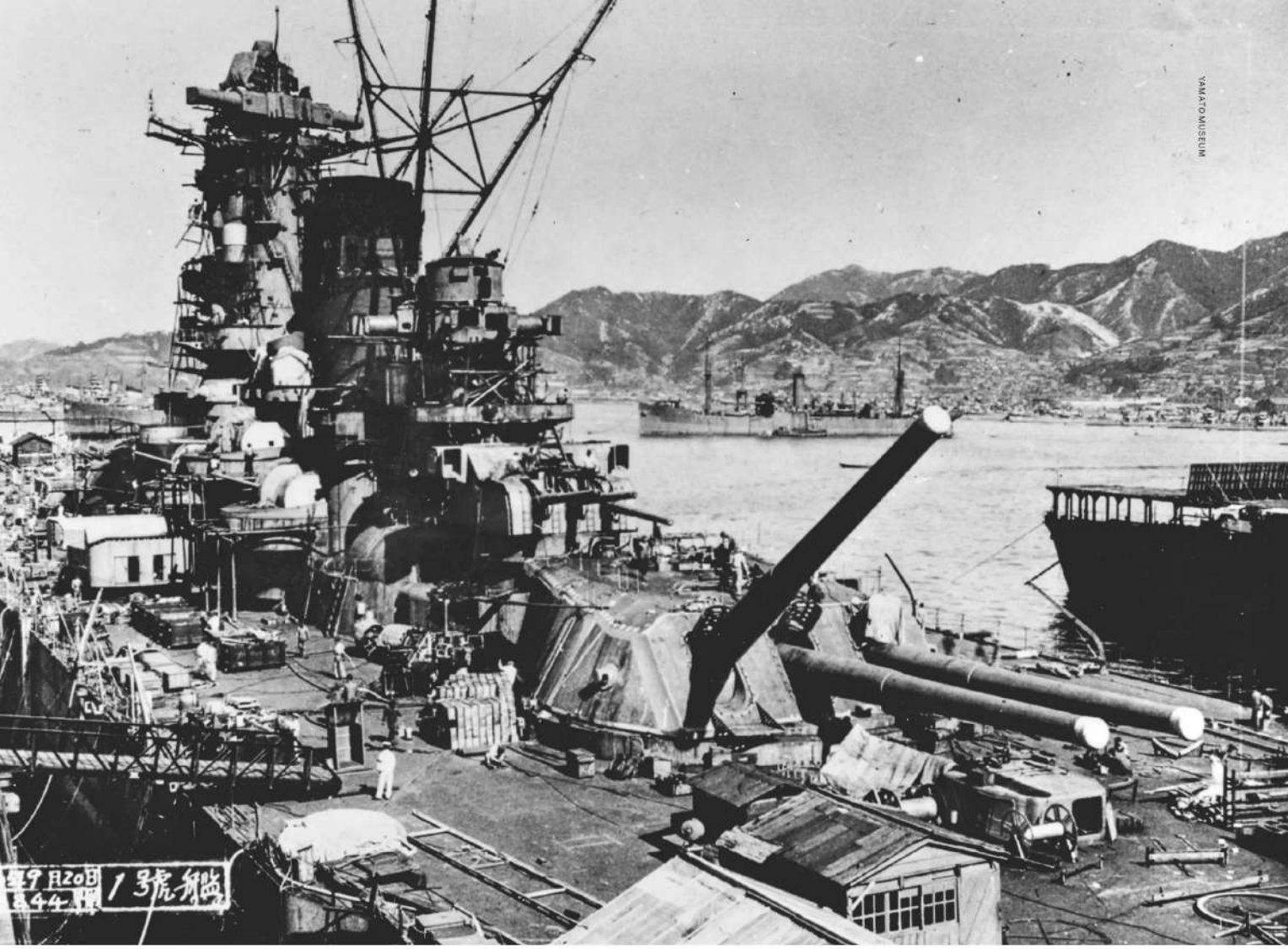
The crew on morning exercise in the summer of 1942 on the foredeck of the *Musashi*, *Yamato's* sister ship.

HISTORIE ARCHIVE

"MUCH EFFORT HAD BEEN PUT INTO THE DESIGN OF YAMATO'S HULL"



YAMATO MUSEUM



***Yamato's* 460-mm guns are calibrated at the Kure naval base, September 1941. The guns were called 40-cm by the Japanese to hide their true size.**

ammunition, however, and this is where *Yamato's* weapons encountered problems.

THE SECONDARY ARTILLERY consisted of four triple turrets with 155-mm guns. These were taken from *Mogami*-class light cruisers, which in turn were re-armed with 20-cm guns. The entire installation of guns, turrets and barbettes was lifted out and fitted on the battleships without any significant modifications.

This meant that vulnerable points were built into the otherwise well-protected battleship, as the new gun turrets and barbettes retained their thin 25-mm armour from the cruisers. This left four insignificantly protected routes deep into the ship for aerial bombs and artillery shells in the otherwise 200-mm armoured ship. It can be argued that the risk of this vulnerability far exceeded the value of the guns' firepower, especially as restrictions on directional speeds made it impossible to operate them against fast aircraft targets.

Anti-aircraft armament was the weakest point of *Yamato*, as it was of all contemporary battleships (except US ones). It consisted of 12 12.7-cm anti-

"THE GUN ITSELF HAD A LIMITED EFFECTIVE RANGE"

aircraft guns and 24 25-mm anti-aircraft machine guns, which were increased to 24 and 152 pieces of these calibres respectively by the end of the war. The 12-cm guns were excellent artillery pieces, but their fire control and ammunition could not cope with anything other than simple targets on a straight course and constant height and speed. Otherwise, they had to rely on barrage fire.

The light anti-aircraft weapons had a limited number of centre sights for the two- and three-barrel guns; however, they also suffered from the same limitations as the control system of the heavy anti-aircraft guns. The gun itself had a limited effective range, a moderate practical rate of fire (requiring a magazine change after 15 rounds) and a relatively weak shell. There was no equivalent of the Allies' excellent



A Grumman TBF Avenger drops a Mark 13 torpedo.

US NAVY

40-mm Bofors gun (a machine gun with gyro centre sight, later with radar support) throughout the war.

NO SHIP EVER had such thick and heavy armour as *Yamato* and her sister ships. The aim was to make them virtually invulnerable to the heaviest naval artillery available and to one-tonne aerial bombs dropped from 3-4 kilometres.

One can debate the quality of the armour (mostly of the British World War I type) and its design (no thin armour ahead of the main armour to destroy the armour-piercing nozzles of enemy shells), but the fact remains: in a ship-to-ship duel with optical visibility, the armour protection would allow *Yamato* to withstand fire from all but the heaviest US shells at distances over 30 kilometres (where their 32-degree angle of attack provided an opportunity to penetrate the *Yamato's* deck armour). At the same time, hits from her own artillery was – with a few exceptions – expected to penetrate the armour of virtually all US battleships at much shorter ranges.

As for aerial bombs, as expected, the 454 and 227-kg bombs that hit *Yamato* and *Musashi* respectively did not penetrate their armoured decks.

A REVIEW OF the events of World War II reveals that artillery fire or bombs were rarely enough to sink a battleship on their own, even if they rendered the target completely unfit for combat. Instead, the great 'battleship killer' was the torpedo, whether fired from submarines or surface ships, or dropped from planes.

The lessons of the previous world war had already prompted battleship designers to put a lot of effort into developing protection against torpedoes and mines. Despite this, *Yamato's* underwater defence system contained avoidable defects, although this would not have had a significant impact on the ship's ultimate fate.

World War II was a breakthrough era for military electronics. The importance of radar for air and

Article continues on page 95 ▶

Special Japanese ammunition

★ In 1923, in order to develop improved armour-piercing shells, the Japanese carried out test shots against a decommissioned battleship. It was noted that shells hitting a few dozen metres in front of the target could follow a straight path through the water to hit the target's unprotected underwater hull.

The Japanese now developed an anti-tank shell (Type 91), whose impact in water exposed a sharp armour-piercing nose, which gave the shell a stable underwater path. It was fitted with a fuse with a delay adapted for passage through water and then penetration of the ship's hull (a 0.4-second delay against the usual 0.025 seconds). In a direct hit on a well-armoured target, the shell acted in a similar way as a normal armoured shell. Against lightly or moderately armoured targets, the long delay meant the shell passed through the entire target before detonating, as in the Battle of Samar. There is only one example where the shell worked as intended, penetrating an ammunition magazine after passing through the water. This type of shell was the main armour-piercing ammunition for most Japanese naval guns of 15-cm calibre and above.

What can be described as an anti-aircraft shell (*San Shiki* or *Sanshikidan* Type 91/3) was also developed, in calibres from 15 to 46 cm. It was detonated with a delay fuse and spread a large number of incendiary tubes (up to 900) in a cloud around the detonation point. Each tube emitted a very hot, metre-long flame for a few seconds, which was thought to be capable of igniting any aircraft it came into contact with. Although several hundred shells of this type were fired, its effectiveness appears to have been negligible.

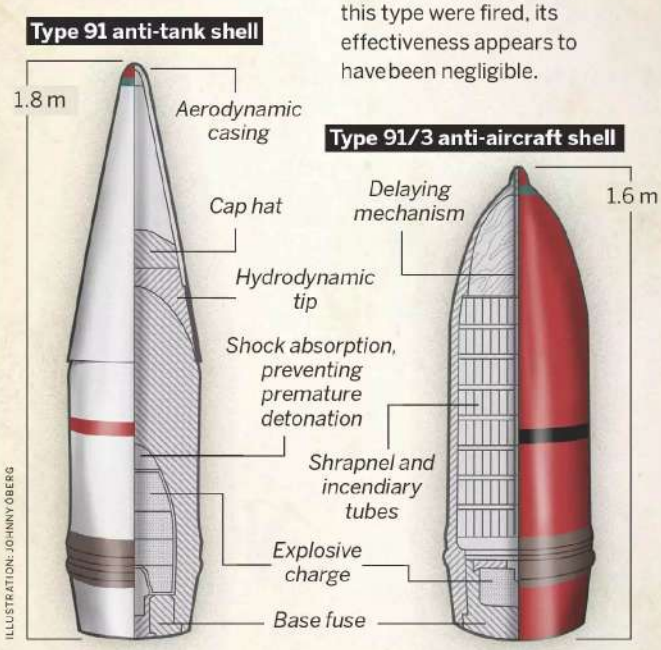
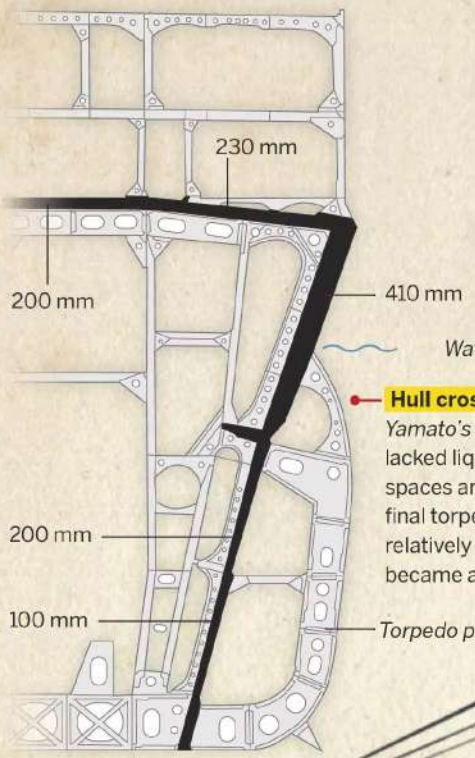


ILLUSTRATION: JOHNNY ÖBERG

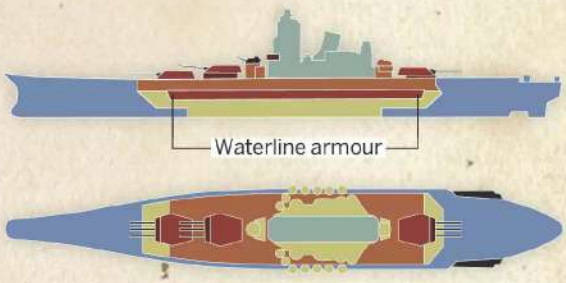
YAMATO

Yamato and her sisters were the largest and most heavily armed artillery ships of WWII. Japan believed that size alone and massive guns were sufficient to control the seas.

ILLUSTRATION: JOHNNY ÖBERG



Hull cross-section amidships
Yamato's underwater protection lacked liquid-filled, dampening spaces and a thin but flexible final torpedo bulkhead. Her relatively heavy armour thus became a weakness.

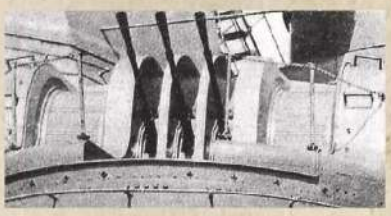


Thickness of Yamato's armour
30 mm — 650 mm

Rangefinder
The rangefinder had a 15-metre base and helped guide the main artillery.

Command bridge
The commander gave orders by voice tube, telephone and pneumatic mail.

Gun turrets No 1 and 2 _Yamato's_ forward 460-mm guns. The barrels were 21 m long and the range of their armoured shells was 42 km.



One of *Yamato's* triple 25-mm anti-aircraft guns. The rate of fire was low: 110-120 rounds per minute.

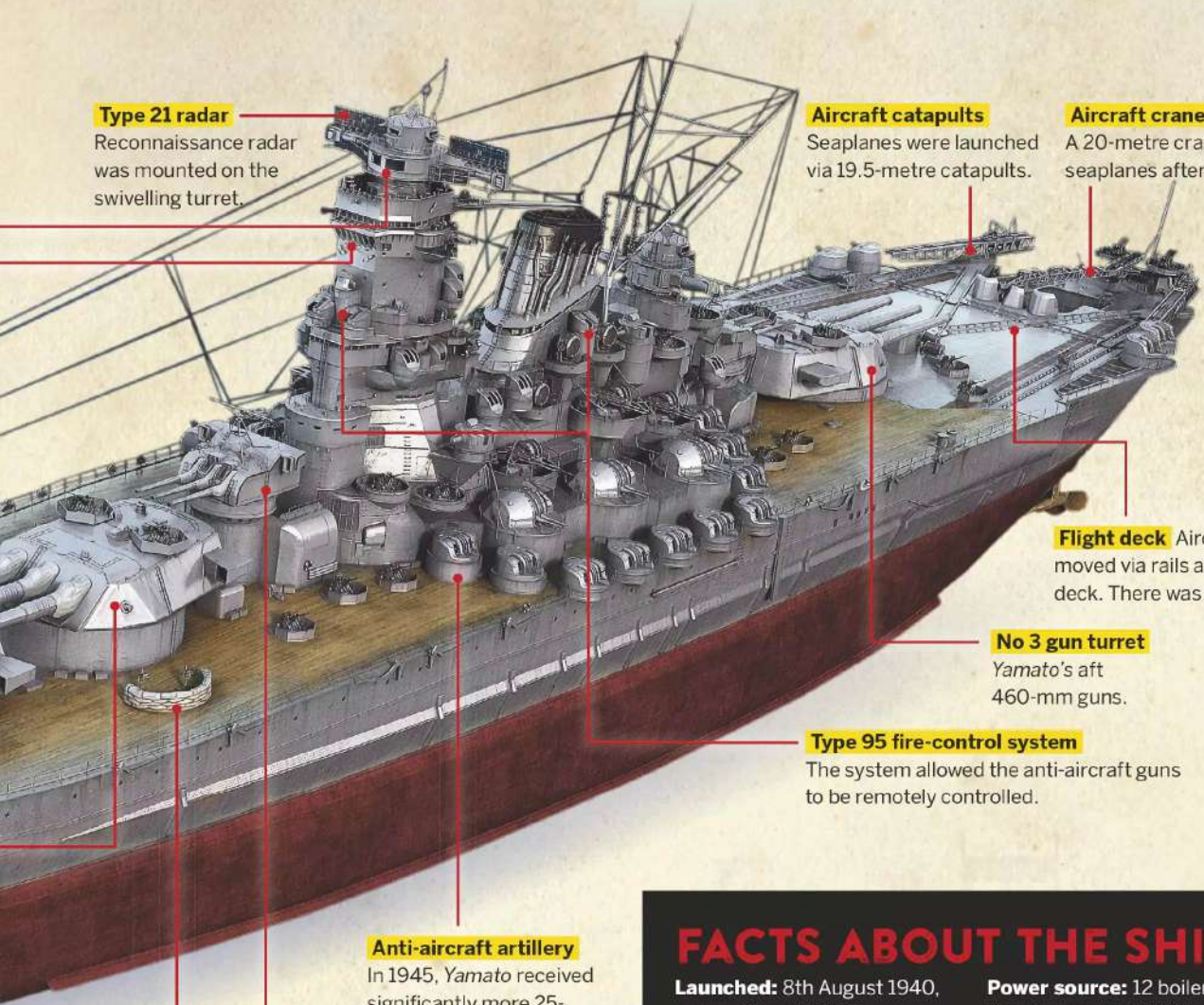


Yamato was intended to carry the Mitsubishi F1M1 Pete (above) and Aichi E13Ai Jake seaplanes.



The senior officers of *Yamato* photographed on 5th April 1945, two days before the battleship was sunk.

HISTORIC ARCHIVE (3)



Type 21 radar
Reconnaissance radar was mounted on the swivelling turret.

Aircraft catapults
Seaplanes were launched via 19.5-metre catapults.

Aircraft crane
A 20-metre crane lifted seaplanes after they landed.

Flight deck Aircraft were moved via rails across the deck. There was no hangar.

No 3 gun turret
Yamato's aft 460-mm guns.

Type 95 fire-control system
The system allowed the anti-aircraft guns to be remotely controlled.

Anti-aircraft artillery
In 1945, *Yamato* received significantly more 25-mm anti-aircraft guns.

155-mm guns
The guns were mainly intended for surface targets.

Artillery on deck
Soldiers manning the 25-mm pieces on deck were protected by no more than a wall of sandbags.

FACTS ABOUT THE SHIP

Launched: 8th August 1940, ordered March 1937.
In service: 16th December 1941 until 7th April 1945.
Dimensions: 263 m long and 38.9 m wide, 11 m draught.
Displacement: 65,027 tonnes, 71,659 tonnes fully loaded.
Crew: 2,500-2,800 men.
Engine: Four steam turbines, four three-bladed propellers.
Power source: 12 boilers.
Maximum speed: 27 knots.
Range: 7,200 nautical miles (13,334 km at 16 knots).
Gun armament (in 1945):
- 9 x 460 mm
- 6 x 155 mm
- 24 x 127 mm
- 152 x 25 mm (anti-aircraft)

Aircraft: Maximum 7, 2 catapult launchers.



"YAMATO WAS REPEATEDLY TARGETED BY THE INCREASINGLY NUMEROUS AND AGGRESSIVE US SUBMARINES"

Two Nakajima B5N2 Kate torpedo aircraft above the naval base at Truk in 1943. Below is *Yamato* at anchor.

HISTORIE ARCHIVE

naval warfare cannot be overestimated. For the Japanese Navy in general and the super-battleships in particular, their late and comparatively primitive adoption of radar technology – not only for reconnaissance and fire control but also for accurate shell launch – was a handicap for which they never managed to compensate. *Yamato* received the latest and greatest in radar technology the Japanese could achieve with German assistance and the imitation of captured Allied equipment, but her technological disadvantage was fundamental.

SO, HOW DID this iconic ship fare in service? *Yamato* was laid down on 4th November 1937 and handed over to the Japanese Navy on 16th December 1941. This was an impressively short construction time when you consider the problems created by the lack of metal alloy, the extreme secrecy, which required the shipyard to be shielded by sisal sheets, and the unusual weight and size of the structural elements, among other factors.

By May 1942, the crew and the ship's various subsystems were readied so that *Yamato* could participate as the commander-in-chief's flagship in the operation against the US island of Midway. However, her involvement was fairly modest – *Yamato* stayed a reassuring 2,000 kilometres from the island and had no physical contact with the enemy. There followed a period of more than two years of flagship service, mostly in forward base areas, overhauls and modifications at shipyards in Japan, and training and exercises to familiarise the crew members with new equipment.

ALSO COMMON WERE changes of commander – taking charge of *Yamato* was apparently seen as a suitable final step before promotion to the rank of rear admiral.

US NAVY



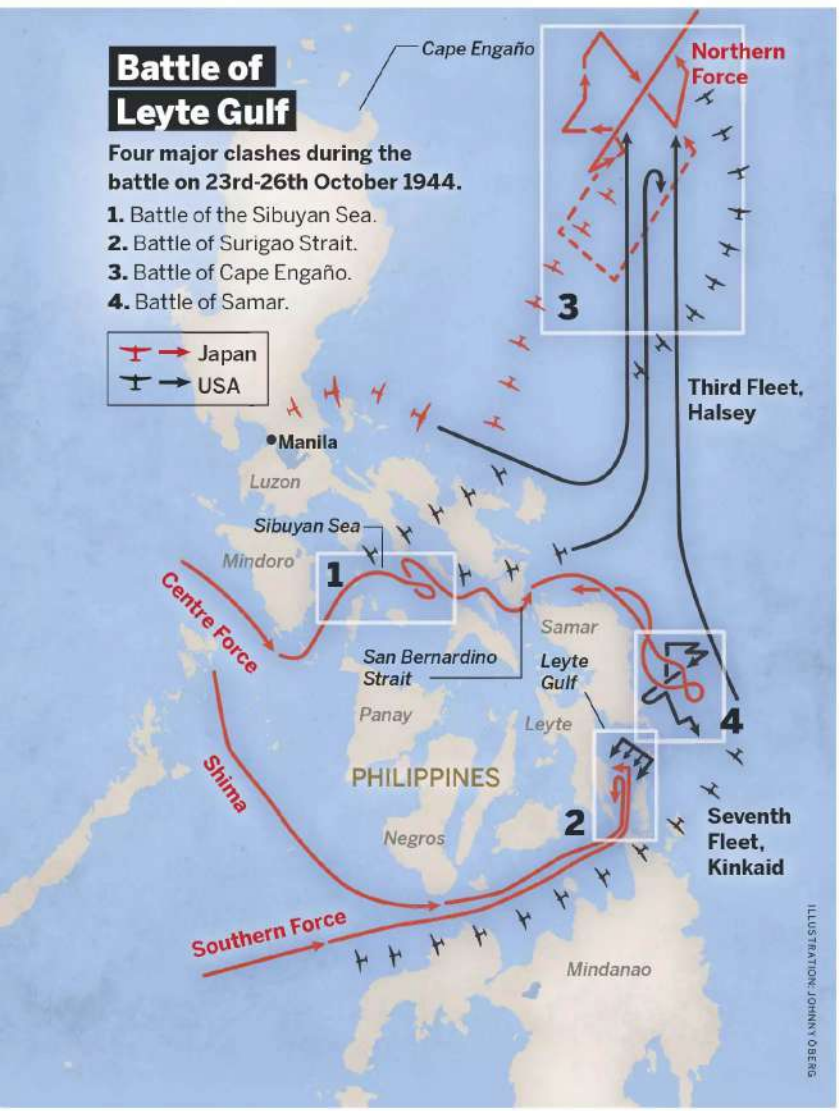
The American submarine USS *Skate* hit *Yamato* with a torpedo.

However, *Yamato* was repeatedly targeted by the increasingly numerous and aggressive US submarines. Fast warships were often a futile target for the submarines of the time, but in one case, they managed to get a successful shot at *Yamato*. It was on Christmas Day 1943, north-east of the base area around Truk Atoll, when a salvo of four torpedoes from the US submarine *Skate* hit near the aft gun turret. The torpedo's 303-kg Torpex warhead split the armour along a seam, and more than 3,000 tonnes of water leaked in, including into the gun turret's magazine, rendering it unusable. *Yamato* was allowed to return home after temporary repairs in Truk, where she was dry-docked for two weeks to repair the damage. The encounter revealed that the battleship's torpedo protection was inadequate. There was no opportunity to improve it significantly,

YAMATO MUSEUM



Officers aboard the *Yamato* in 1942, with Admiral Yamamoto, sixth from the left in the front row.



"YAMATO WAS SUBJECTED TO TWO DIVE-BOMBING ATTACKS"

first time, battleship giants were allowed to fire their guns at the enemy, but only at their aircraft. A potential battle between the two sides' battleships was avoided by the US Navy's cautious approach – it rightly saw its task as protecting the invasion fleet, not trying to create its own Battle of Jutland in the Pacific.

The Japanese lost most of their remaining air force – some 600 aircraft – while US losses were limited to 123 planes. Three Japanese aircraft carriers were also sunk, two of them by submarines. The outcome of these battles had major implications for all future Japanese operations with artillery ships such as *Yamato*, because they were now forced to operate with very little support from their own air forces.

THE NEXT STAGE of the US advance was directed towards the Philippines in October 1944, with one main objective: to recapture the Philippines both as a base for further operations and to liberate the population of the archipelago from Japanese occupation. The gravity of the threat from the Japanese point of view gave rise to a plan to repel the invasion that was desperate in its audacity but also ingenious. The five separate battles that followed took place over more than a week, involving 328 warships and 1,900 aircraft, and are usually referred to collectively as the Battle of Leyte Gulf. It became by far the largest naval and air battle ever fought.

The Japanese had a pretty good idea of the enemy's intentions and began planning how to thwart them well in advance. A lack of fuel had forced the Japanese Navy to concentrate its forces in ports in northern Borneo as well as in bases at home. This meant that they would not be able to respond immediately to a US invasion at its most sensitive stage, but it protected them from any pre-emptive attack. The Japanese battle plan, which correctly anticipated that the enemy would land in the sheltered Leyte Gulf, included two assault forces of artillery and torpedo boats (Centre Force and Southern Force) and a diversionary force of virtually unmanned aircraft carriers (Northern Force). Both *Yamato* and *Musashi* would be part of the Centre Force, which had impressive artillery firepower, with three additional battleships and seven heavy cruisers.

The Centre Force, commanded by Vice Admiral Takeo Kurita, would sail eastwards through the

► but at least the joint between the upper and middle waterline armour, which had proved to be a weak point, was strengthened.

The time in dock was also used to initiate extensive modifications, in which the two midship 15-cm gun turrets were replaced by six 12-cm twin pieces and 50 25-mm anti-aircraft machine guns. In addition, the radar instrumentation, infrared identification equipment and passive radar detectors were all upgraded. The work took another two months to complete with training and familiarisation.

IN JUNE 1944, the US launched a major operation to recapture the Marianas archipelago, including famous islands such as Guam, Saipan and Tinian. The main players in the battles that followed were aircraft carriers and their planes. However, for the



US NAVY/THE LIFE PICTURE COLLECTION VIA GETTY

Yamato is hit by a bomb in the Sibuyan Sea – but it did not cause significant damage.



UNITED STATES COAST GUARD

Marines disembark at Leyte.

Philippine archipelago and approach Leyte Gulf via the northern San Bernardino Strait. The Southern Force would approach Leyte Gulf from the south-west through the Surigao Strait, while the Northern Force would approach the archipelago from the north, east of Luzon. It was hoped that the Americans would be forced to concentrate on that so the other forces could reach their objectives without a fight.

RESPONSIBLE FOR THE remote protection of the Leyte landing was the US Third Fleet under the command of Admiral William Halsey. Its main component was Task Force 38, which Halsey also effectively commanded. This was divided into four operational groups and had an overwhelming force of 16 aircraft carriers, six battleships, 11 cruisers and – most importantly – some 1,000 fighter aircraft. In addition, the Seventh Fleet, including six older battleships and eight cruisers, together with 16 escort carriers and their approximately 400 aircraft, would provide close protection and support for the landing force.

The US landing on Leyte Island took place against little resistance on 20th October. This marked the start of the Japanese operation from bases in northern Borneo and at home. Its goal was to reach Leyte Gulf at dawn on 25th October.

AS THE JAPANESE Centre Force sailed into the Sibuyan Sea on the morning of 24th October, it was subjected to a series of attacks involving 259 US planes. They concentrated for some reason on *Musashi*, which was sunk after nearly 40 torpedo and bomb hits. *Yamato* was subjected to two dive-bombing attacks, resulting in seven hits. None penetrated her deck or turret armour, and the water ingress caused by damage was compensated for. The other Japanese ships generally escaped with minor damage, and the Centre Force continued eastwards towards the San Bernardino Strait in the evening. Followed by night-flying US reconnaissance planes until midnight, half an hour ▶

later the force passed through the strait into the open sea without encountering any US opposition and headed south towards the Leyte Gulf, some seven hours away.

On the night of 25th October, Admiral Halsey, despite reports from his reconnaissance planes, judged that the Japanese Centre Force was no longer a danger and that he could now concentrate his resources against the newly discovered threat from the north, using all three available groups in Task Force 38. Thus, he left the critical San Bernardino Strait unguarded, although a Japanese threat to the invasion fleet at Leyte could only come from there. Nor did Halsey inform any superior or subordinate commander of his plans or that the strait would be left unprotected. Several members of his staff tried in vain to make him realise he was leaving a significant hole in the US defence of the invasion area.



Admiral Takeo Kurita decided to attack the misidentified US ships.

That night, the Japanese Centre Force, now consisting of four battleships and eight cruisers and destroyers, continued southward. US commanders outside Halsey's staff still had no idea of the emerging threat.

East of the island of Samar were three operations groups consisting of 12 small escort carriers of the Seventh Fleet, which were tasked with protecting the landing fleet against air and submarine attacks, and supporting the forces ashore with fighter protection and ground targeting. With over 400 aircraft, it was not an insignificant force, but it was geared towards anything but combat with enemy warships. Therefore, the escort carriers had only a limited number of torpedoes and armour-piercing bombs. Each carrier group had an escort of three destroyers and four fighters for its own protection.

AT 05.23, YAMATO'S aerial reconnaissance radar picked up echoes in the south-east. They turned out to be planes taking off from the northernmost of the three US escort carrier forces. At sunrise half an hour later, visibility was good, although numerous rain showers quickly reduced it. At that point, a number of carriers and their escorts began to be sighted from the Japanese ships at a distance of 43 kilometres. This was the beginning of one of the most unequal and confused but heroic naval battles in history – the Battle of Samar.

The Japanese, after the air raids of the previous day, had expected to meet overwhelming resistance on their way to Leyte Gulf, and now misidentified the enemy ships as a "gigantic enemy task force including six or seven carriers accompanied by many cruisers and destroyers". Adding to the confusion, the planes sent up to report on the situation and perhaps help with fire control were unable to make contact with their mother ships. Their attempts were drowned out by the continuous US radio traffic.

YAMATO OPENED FIRE with her heavy guns at 06.58 at a range of about 32 kilometres, and seemed to hit an aircraft carrier target with the very first salvo – at least, a lot of black smoke was visible. It quickly increased in volume as the US escort sent up a smoke screen, something that would cause the Japanese gunners great difficulty throughout the battle, due to their lack of adequate fire-control radar. The distance between the forces narrowed and the firing intensified as



A division of Wildcat fighters takes off from USS *Kitkun Bay* during the Battle of Samar. Torpedo bomber TBM-1C Avenger on the left.

AUSTRALIAN WAR MEMORIAL

"ON THE US SIDE, ONE AIRCRAFT CARRIER WAS SUNK BY ARTILLERY FIRE"

the Japanese cruisers were also able to engage.

In the confusion, Admiral Kurita now made a fundamental error. He overlooked the fact that his task was to head for the Leyte Gulf and attack the US landing fleet there, for which it would have been appropriate to mass his forces in a battle line on a southerly course and fire on the newly discovered but quite insignificant enemy ships as they passed. Instead, he ordered a "general attack", with the result that the Japanese Centre Force broke up into divisional units of at best a couple of ships, chasing the smoke and haze-covered Americans.



The escort carrier USS *St Lo* explodes after being hit by a kamikaze aircraft.

ALTHOUGH THE COMMANDERS of the escort carrier groups immediately signalled for help – with some messages in plain text, to the delight of the Japanese – none was forthcoming for many hours.

All available aircraft were now deployed against the enemy ships, sometimes with weapons intended for land targets. At 07.16, the commander of the northernmost escort carrier force ordered his three destroyers to counter-attack. With their ten torpedoes per vessel, they posed a serious threat to the Japanese heavy ships, which could not be ignored. A torpedo salvo threatened *Yamato* and forced her first to turn north and then, for ten minutes, to be locked on this course away from the battle, between the torpedo lanes. These counter-attacks were effective in confusing the enemy and influencing the Japanese admiral's decision-making.

The incessant US air attacks resulted in several Japanese cruisers being hit by bombs or torpedoes. In a few cases, fires broke out near the ships' own oxygen-filled torpedoes, which then exploded in the heat. This contributed to the sinking of three of the cruisers.

On the US side, one aircraft carrier was sunk by artillery fire and another was badly damaged by no fewer than 18 hits from 20-cm Type 91 armour-piercing shells, most of which did not detonate but went straight through the target. The shells left holes half a metre in size. When land-based Japanese aircraft intervened, including the first organised kamikaze planes, one of the escort carriers was sent to the bottom of the sea in a spectacular explosion.

The situation for the head of the Centre Force as regards his ability to make decisions was probably more difficult than one might imagine. Over the past few days, he had seen US submarine and air attacks reduce his force by as much as a third. After the promising passage out of the San Bernardino Strait, they had unexpectedly encountered US forces that the weary staff officers on the flagship had both misidentified and ▶

Ship's iconic status lives on today

★ Right from the design stage, *Yamato* acquired a special status in Japanese culture. Her size, speed and power embodied Japan's determination and readiness to defend its interests against Western powers, especially the USA. She gave fleet personnel a deep sense of confidence in the navy. The symbolic strength of *Yamato* led some to believe that the empire would never fall as long as the ship could fight. As the post-war Japanese sought to redefine themselves, *Yamato* became a symbol of heroism. More than half a century after the war, the memory of *Yamato* lives on. The name became a metaphor for the end of the Japanese empire. In April 1968, a memorial tower was erected to commemorate those who lost their lives during the final operation.

In October 1974, a new science-fiction television series based on *Yamato* was broadcast. It was a great success and led to eight feature films and four more TV series, the latest of which was aired in 2017. In 2005, the Yamato Museum was opened near the site of the former Kure shipyards. On the ground floor of the museum is a 26-metre-long model of *Yamato* (1:10 scale).



The film *Yamato*, released 2005.

Later that year, a feature film was released to commemorate the 60th anniversary of the end of World War II. The film used a partial life-size model and tells the story of the sailors on board the doomed battleship.



US naval aircraft attack the Japanese battleship near Kure Base.

U.S.NAVY

overestimated. The Centre Force had disintegrated into sub-units after Kurita's ill-fated "general attack" order, causing him to lose control of the battle.

The ceaseless attacks by US planes – not only with bombs and torpedoes but also with machine-gun fire and rockets – as well as the heroic attacks by US escort ships against the superior force, could not fail to have affected Kurita, who had also not slept for 48 hours.

AT THIS POINT – with the Japanese force almost past the US ships and only a few hours' passage between them and the Leyte Gulf – the Japanese admiral's resolve began to waver. At 09.11, he ordered the battle to be temporarily suspended to regroup further north, a manoeuvre that took a couple of hours, during which the US air strikes continued. Meanwhile, Kurita also received word that the Southern Force's overnight attack had completely failed. If he continued into the Leyte Gulf, he could therefore expect to encounter an intact US defence force. At about 12.30, Kurita finally decided to retreat, influenced by factors such as the Americans' willingness to fight, his own losses, a perceived strong defence of the Leyte Gulf and an unwillingness to sacrifice his ships and their crews in an increasingly hopeless undertaking. These motives have been elicited from the various reasons he gave in the few interviews he granted, some of them long after the war.

"THE AMERICANS' PLAN WAS TO LET YAMATO GET CLOSER BEFORE ATTACKING"

In the evening, the Japanese again managed to slip back through the San Bernardino Strait into the islands and straits of the Philippines. The retreat of the remainder of the Centre Force in the same direction was relatively successful,

despite repeated air attacks by Task Force 38. *Yamato* was hit by two bombs, which caused no major damage. In retrospect, when her performance in the Battle of Samar was checked with US sources, the fact emerges that none of the 104 heavy shells she fired found their targets, despite the initial covering salvo. The hits on other escort carriers and the sinking of destroyers were achieved primarily by shots from the six heavy cruisers.

YAMATO WITHDREW TO the Brunei base area and a month later regrouped at Kure Naval Base in the Japanese homeland. There she began a month-long period in dry dock to repair the battle damage and have a final refit that further increased the number of automatic anti-aircraft guns.

In March 1945, the US Navy's attack on naval targets in the Japanese homeland began with a 240-aircraft carrier strike against Kure itself. Almost every ship at the base suffered extensive damage, except for *Yamato*, which was away on exercises during part of the raid. She escaped with a bomb hit that did little damage. *Yamato* now had to replenish her ammunition stores and restock with fuel oil, which meant that some destroyers were completely depleted of this increasingly scarce resource. She was then redeployed to Mitajiri Bay, south-west of Kure, to reduce the risk of air attacks.

YAMATO'S LAST ACTION came with the US landing on Okinawa on 1st April 1945, which drastically increased the threat to the Japanese homeland. The Japanese ability to influence events was very limited and essentially took the form of various types of suicide attack by land, sea and air. Even *Yamato* was now seen as a suitable vessel for a mission against the invasion force, which had little chance of success due to the total dominance of the US forces. On the afternoon of 6th April, *Yamato* and an escort of one light cruiser and eight destroyers left port and headed south towards Okinawa, although by now the Americans had gained a foothold on the island.

The Japanese force was sighted almost immediately by a US submarine, and its reports eliminated any chance of surprise. The US carrier forces had plenty of time to organise their own reconnaissance of *Yamato* and to prepare an attack. From about 08.30 the following day, US aircraft – a group of fighters and two radar-equipped flying boats – began to shadow *Yamato* from a safe distance and report her position, course and speed. Their presence does not appear to have been significantly affected by the fighter cover of a few Zeke aircraft that was reportedly in place over the Japanese naval force from just after dawn until 10.30. The Americans' plan was to let *Yamato* get closer before attacking, because shorter distances were an advantage against an enemy that did not have its own attack aircraft, and they could load the dive bombers with the heaviest bomb they had at 908 kilograms. A total of 280 planes were deployed during the day.

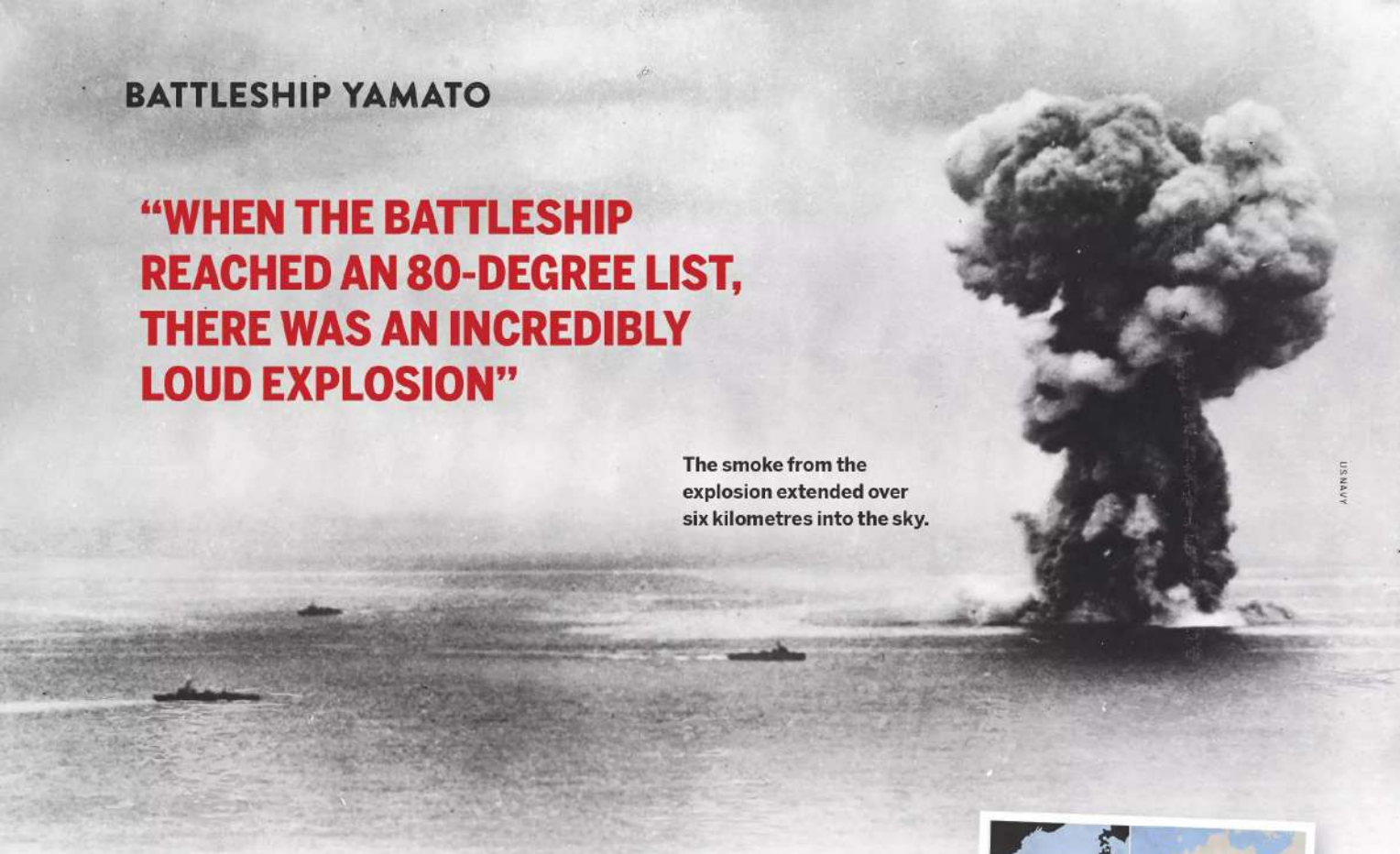

US NAVY

***Yamato* had a severe list after being hit several times.**

YAMATO AND HER escort sailed in an anti-aircraft formation, with the battleship in the centre and the other ships forming a circle with a radius of about 1,500 metres around her. Shortly after 11.00, *Yamato's* aerial reconnaissance radar indicated two large groups 117 kilometres away on a northerly course. Moments later, eight US fighter planes began circling above the Japanese force to clear the airspace of possible defensive fire. The weather was windy with a cloud base of over a kilometre and visibility was described as variable, but often poor. This greatly favoured the Americans, because the Japanese air defence was directed entirely visually, while the Americans' radar-equipped reconnaissance aircraft were able to maintain contact with their target regardless of the weather and guide the attack. Torpedo planes could also hide in the clouds while manoeuvring into a suitable attack position.

At 12.32, *Yamato* sighted the first enemy aircraft and shortly afterwards opened fire with both 46-cm and 12-cm guns. The former fired Type 3 anti-aircraft incendiary/shrapnel grenades. The volume of fire was considerable but accuracy was ▶

"WHEN THE BATTLESHIP REACHED AN 80-DEGREE LIST, THERE WAS AN INCREDIBLY LOUD EXPLOSION"



The smoke from the explosion extended over six kilometres into the sky.

US NAVY

no better than in previous battles. The initial attacks by dive bombers resulted in three to six hits with 454-kilogram and 227-kg bombs, with one group hitting around the weak area of the aft 15-cm gun turret and its barbette, creating an 18-metre-wide hole and starting fires deep in the ship near the ammunition stores. These were never fully extinguished. The greatest danger, however, came from the torpedo planes. For a few minutes around 12.45, *Yamato* was hit by up to four torpedoes (details vary), all on the port side. Her torpedo defences were breached, a turbine room began to fill with water and the ship listed to port. Counter-filling on the other side of the ship soon eliminated the list. At the same time, some 60 aircraft had begun attacking ships in the escort force, which naturally reduced its ability to protect *Yamato*.

ABOUT TEN MINUTES later, the next air strike was launched. This time the Americans concentrated on initially depressing the Japanese anti-aircraft fire by firing machine guns and rockets from fighter planes at *Yamato*. Immediately afterwards, dive bombers attacked, making frequent course changes in their dives towards their target. The Japanese anti-aircraft defences were ineffective, because neither the guns' fire-control instruments nor their lateral and elevation machinery could cope with the planes' rapid changes in course and altitude. There was a number of bomb hits, but without causing any significant damage. The third attack was launched half an hour later, involving 110 aircraft. Twenty torpedo planes circled the target at the lower edge of the cloud cover to achieve the optimum target angle. In the first strike, at least three torpedoes hit amidships on the port side and in the next strike two more torpedoes hit, one on the starboard side. Two boiler rooms and one turbine room began to fill with water, and the resulting list was remedied by filling additional boiler rooms with water. *Yamato's* speed now dropped to 18 knots.



The site where *Yamato* was sunk off Okinawa.

AT AROUND 13.45, the last attack was launched. Reports from the badly damaged battleship were increasingly confused, but four more torpedo hits were supplemented by three bomb hits and a number of bomb blasts detonating close to the ship's side. The last boiler room was now filled with water, the speed decreased further and *Yamato* had an increasing list that could no longer be fixed by counter-filling. Orders were given to abandon ship and the Emperor's portrait was taken down from the bulkhead and packed for evacuation. When the battleship reached an 80-degree list, there was an incredibly loud explosion, probably in the 500 tonnes of ammunition that *Yamato* was carrying. This may have been caused by the detonation of

shells as they fell out of their racks. The battleship had then been hit by about ten aircraft torpedoes and 13 aerial bombs.

Human losses totalled 3,062 men on the Japanese side (269 men were saved) and 12 men and ten aircraft on the American side. The proportions of losses in the sinking of the *Musashi* are of the same order of magnitude. Proposals have been made to salvage the *Yamato* (she lies at a depth of more than 300 metres), give the crew's remains a ceremonial burial and build a museum around the wreck. So far, nothing has been done.

YAMATO AND HER sisters were designed according to a vision of naval warfare that was rooted in the experience of World War I, and they were optimised to be superior in ship-to-ship combat. Their creation reflected the fundamentally aggressive attitude towards the outside world that had begun to characterise Japan after her victory in the 1905 war with Russia. It appears to be a case of hubris that the Japanese turned a blind eye to the fact that the country's gross domestic product at the time was only one seventh of that of its predicted main opponent, the United States. This attitude is best reflected in the then common assessment of Western culture among Japanese military personnel: the West was decadent and lacking in fighting spirit.

ONE CONSEQUENCE OF *Yamato's* and *Musashi's* position as almost irreplaceable, iconic symbols of the power and glory of the Japanese Navy was their cautious operational use. The battleships were only put into combat in earnest when developments in warfare and tactics made their unique combination of characteristics irrelevant.

During the period of the Pacific War when battleships were of great importance – the autumn of 1942 in the battles for Guadalcanal – Japan would have benefited far more from a number of modern battleships that were smaller and cheaper than it dared to risk in an offensive and probably – at least in the short term – successful operations. *Yamato* and her sister ships therefore represented a very common but erroneous view of future naval warfare during this period, and an example of a dubious balance between quantity and quality.

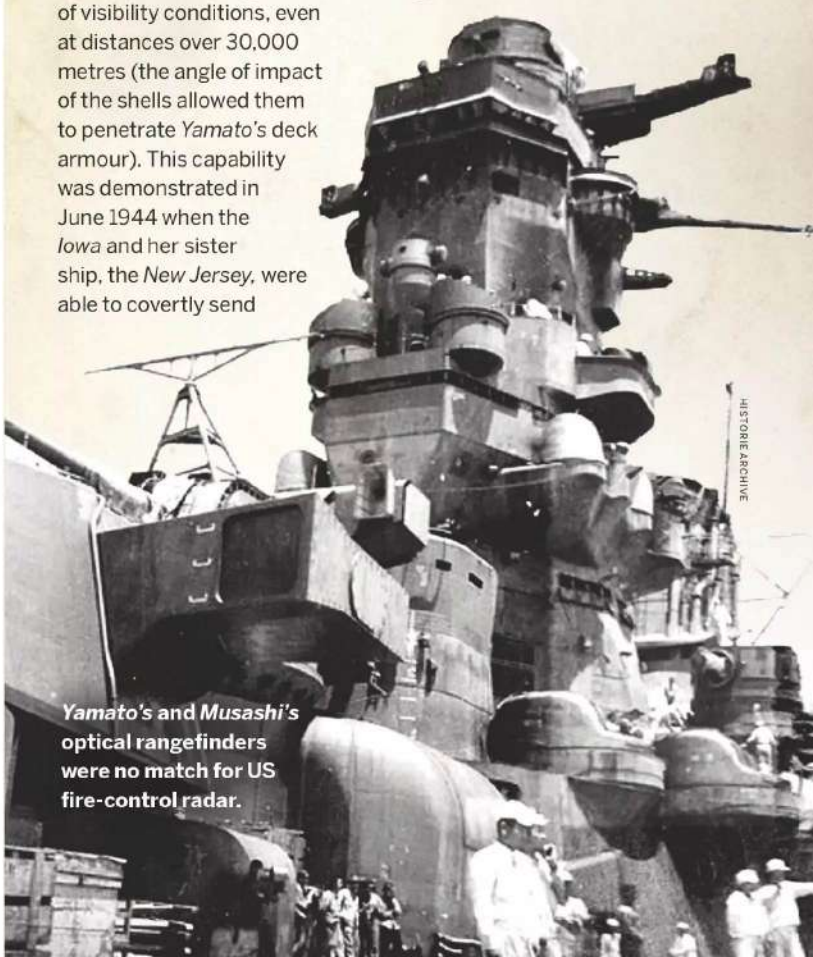
Johan Lupander is a military history writer and author.

Unevenly matched radar

★ The Japanese's excellent optical rangefinders and modern calculators could theoretically produce satisfactory shooting results in good optical visibility. But on the one occasion when the *Yamato's* guns were used against naval targets, she didn't score a single hit. Allied battleships had fire-control radar that could measure both a target's bearing and its distance, regardless of optical sight, and observe the water spray from shell impacts to regulate the fire.

In a hypothetical duel with the *Iowa*-class US battleships, their speed advantage would have enabled them to choose a combat distance and conditions (darkness, poor visibility) in which *Yamato* could not see her opponent. An *Iowa* type would then have been able to fight her with radar fire control regardless of visibility conditions, even at distances over 30,000 metres (the angle of impact of the shells allowed them to penetrate *Yamato's* deck armour). This capability was demonstrated in June 1944 when the *Iowa* and her sister ship, the *New Jersey*, were able to covertly send salvoes around the Japanese destroyer *Nowake* (running at top speed) at distances up to 35,600 metres.

In addition, the US Mk.1 fire-control calculator was equipped with continuous automatic input of the ship's position, course and speed. Ships with this equipment could turn sharply while firing without reducing accuracy for more than a few seconds. Before, it could take several minutes before the fire-control system could again deliver reliable values for the direction of the guns. At long ranges, the shells could take 1.5 minutes to reach the target, so freedom of manoeuvre was tactically very important. If the ship could change course unhindered in the meantime, she was much more difficult to hit than if she kept a straight course.



***Yamato's* and *Musashi's* optical rangefinders were no match for US fire-control radar.**

HISTORIC ARCHIVE

Denmark Strait, 1941

BISMARCK'S ONLY VICTORY



DEUTSCHES HISTORISCHES MUSEUM

The German battleship *Bismarck* and heavy cruiser *Prinz Eugen* were set to strike at British convoy traffic across the Atlantic. In the Denmark Strait between Iceland and Greenland, they managed to defeat the British ships *Hood* and *Prince of Wales*. It would be a short-lived triumph.

Text: **NIKLAS ZETTERLING**

The lookouts on HMS *Suffolk*, a heavy cruiser in Britain's Royal Navy, had a thankless task. The weather in the Denmark Strait between Iceland and Greenland was unpredictable, with fog banks that helped mask the ship, but while she might lay hidden at one moment, the fog might suddenly dissolve to reveal her position in the next. At these northern latitudes it was still light in the evening at this time of year, 23rd May 1941. Her captain, Robert Meyrick Ellis, kept his ship close to the fog because he wanted to be able to take cover if the enemy appeared.

At 19.22, Able Seaman Newell suddenly hooted: "Ship, bearing Green One Four Oh," before amending his sighting to: "Two ships bearing Green One Four ▶



***Last Battle of the Battleship Bismarck*, painting by artist Claus Bergen from 1949.**

DENMARK STRAIT, 1941



LIBRARY OF CONGRESS

The British depended on convoy traffic across the Atlantic, so protecting the ships was critical. Here an United States airship hovers over a convoy in June 1943.

► Oh." Ellis rushed to the starboard side and raised his binoculars. He immediately spotted the German battleship *Bismarck*, followed shortly afterwards by a heavy cruiser travelling in its wake, *Prinz Eugen*.

The situation demanded a swift response. Ellis was told that the distance to the enemy vessels was 13 kilometres. But the fog seemed to be heading towards his ship. Sure enough, *Suffolk* was soon enveloped by the protective fog. The Germans did not seem to have detected the British cruiser, perhaps because she'd been difficult to make out against the fog bank.

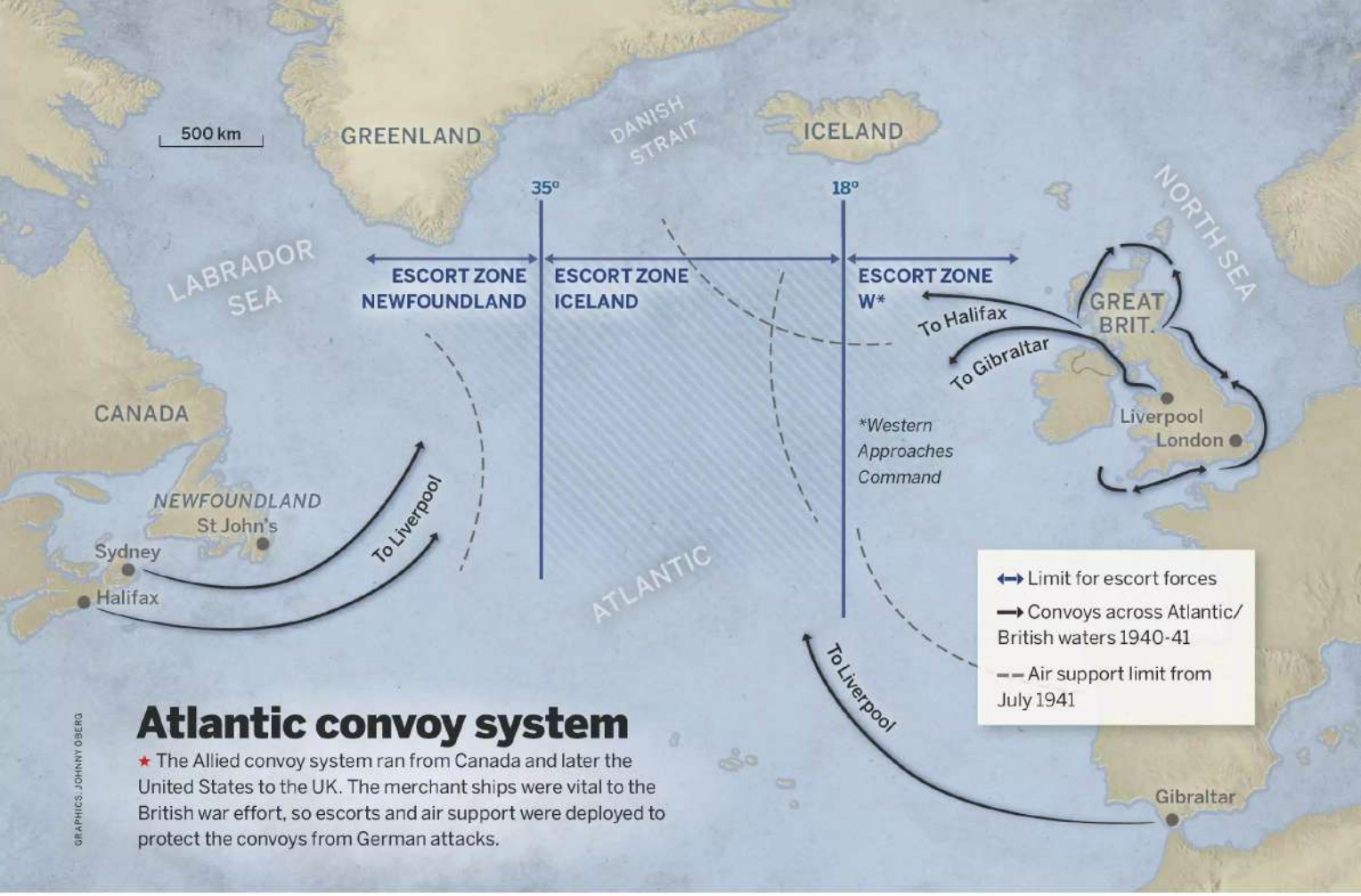
Ellis immediately gave orders to report to the Admiralty that the German battleship and accompanying cruiser had been sighted. *Suffolk* remained hidden in the fog, relying on her radar to follow the German ships. If only the British cruiser could shadow the German squadron and continuously reveal its position, a stronger British battle cruiser squadron could engage *Bismarck* and *Prinz Eugen*. It was no easy task, as the Germans were travelling at nearly 30 knots, but Ellis and his crew did what they could.

AT FIRST GLANCE, it may seem strange that a German battleship and cruiser were trying to pass through the Denmark Strait. The distance from their own bases was great, which made the endeavour risky. But German naval command had a clear idea about the operation. It was based on a concept known as cruiser warfare, its aim to cut off Britain's vital imports from other countries. Huge numbers of convoys travelled across the Atlantic to British ports, and it was these that were the target of the Germans' plans.

The Kriegsmarine had developed the tactic during the inter-war period. By stationing supply ships in the Atlantic, German surface ships could stockpile fuel and other supplies at sea. In this way, they hoped to conduct sustained operations against Allied convoy routes and cut off imports to the British Isles.

In the early stages of the war, the Germans deployed mainly individual ships, such as heavy cruisers *Admiral Scheer, Admiral Graf Spee* and *Admiral Hipper*. A major incursion was made by the battleships *Scharnhorst* and *Gneisenau* in late 1939, but they were discovered when the German ships reached the south-east of Iceland. The commander of the German force, Admiral Wilhelm Marschall, promptly cancelled the operation and returned to Wilhelmshaven.

AFTER THE GERMANS indefinitely postponed *Operation Seelöwe* (Sea Lion), the planned invasion of Britain, the Kriegsmarine was able to prioritise cruiser warfare. In January 1941, a new operation,



Atlantic convoy system

★ The Allied convoy system ran from Canada and later the United States to the UK. The merchant ships were vital to the British war effort, so escorts and air support were deployed to protect the convoys from German attacks.

GRAPHICS: JOHNNY ÖBERG

code-named Berlin, was launched and lasted two months. Again, *Scharnhorst* and *Gneisenau* formed the force, this time under the command of Admiral Günther Lütjens.

Operation Berlin was the first large-scale attempt by the Germans to halt British convoy traffic across the Atlantic. The results were mixed. A total of 22 merchant ships were sunk or captured by the Germans, a meagre figure that would do nothing to block British shipping. No convoy traffic had felt compelled to turn back while the German force operated in the Atlantic.

There were several factors that prevented the Germans from achieving greater success. One was the difficulty in locating the convoys. The Germans had insufficient intelligence and the areas they needed to search were huge. Another problem was strong escorts. To the Germans' surprise, they encountered British battleships escorting some of the convoys. Although these were older battleships, they were armed with 38-cm guns, while *Scharnhorst* and *Gneisenau* carried only 28-cm guns. Moreover, it would be risky to fight so far out in the Atlantic. If any German ships were damaged, they would find themselves in an extremely awkward situation, with the Royal Navy between them and their homeland. The importance of preserving the warships' full combat

"THEY ENCOUNTERED BRITISH BATTLESHIPS ESCORTING SOME OF THE CONVOYS"

effectiveness made the Germans wary of engaging escorted convoys.

In spring 1941, German High Command prepared for the large-scale invasion of the Soviet Union, which was to be launched on 22nd June 1941. Chief of the Naval Command, Grand Admiral Erich Raeder, realised that the attack on the Soviet Union would shift the centre of gravity of German warfare to the east, where the navy had a secondary role to play. Few service chiefs would have realised such a situation.

In the spring of 1941, two brand new German battleships neared completion. The sister ships *Bismarck* and *Tirpitz* were much more heavily armed and better protected than *Scharnhorst* and *Gneisenau*. The aim was that all four battleships would be able to carry out a joint operation. With such a strong force, the Germans hoped to inflict considerable damage on British shipping.

BUT HOPES FOR a joint operation were dashed. *Gneisenau* and *Scharnhorst* had arrived in the port ▶

of Brest in the far west of France after Operation Berlin. They had suffered damage from air raids that required repairs. In addition, their engines were worn out after the two-month voyage and needed an overhaul. Neither ship would be ready for action before the summer of 1941. Nor was *Tirpitz* fully trimmed before the summer. This left only one battleship: *Bismarck*.

In this situation, it might have been wise to postpone the operation, but there were several drawbacks. To reach the convoy routes, the German ships had to pass through the waters north or south of Iceland. With summer came lighter nights and less chance of fog. Since the Germans wanted to sneak out into the Atlantic undetected, they depended on night-time darkness and poor visibility. If the operation didn't start before June, it would have to wait until the summer was over, when the eastern campaign would be in full swing. After much deliberation, it was decided to conduct the operation with only *Bismarck* and *Prinz Eugen*. Admiral Lütjens would be in command.



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Admiral Günther Lütjens.

"THE CREW DIDN'T KNOW IF IT WAS AN EXERCISE ... OR SOME IMPORTANT MISSION"

BISMARCK WAS STATIONED in the Baltic Sea in mid-May 1941 at the naval base in Gotenhafen, the new German name for the Polish city of Gdynia. As early as 24th January, *Bismarck* had been declared ready for action, and in the spring, the ship's commander had conducted exercises to drill the crew.

It was an overcast morning in Gotenhafen on 18th May when *Bismarck* and *Prinz Eugen* weighed anchor and sailed out into the Baltic Sea. The crew didn't know if it was an exercise, regrouping or some important mission. Lütjens briefed – as far as was possible at this stage – the commanders of *Bismarck* and *Prinz Eugen*, Captain Ernst Lindemann and Vice Admiral Helmuth Brinkmann respectively, on the details of the forthcoming operation.

After a short voyage, the force paused to replenish provisions and fuel from supply ships. The German force headed further west, hoping to pass through the straits around Denmark under the cover of darkness. This proved to not quite be the case. As daylight dawned, the German ships had not yet crossed the Great Belt. Cloudy skies initially provided protection against British aerial reconnaissance, but as the Germans sailed on to the Kattegat, the clouds dissipated.

The risk of being detected increased significantly and soon enough it became apparent that several Danish and Swedish fishing vessels were in the waters. Worse still, the Swedish seaplane cruiser *Gotland* was in the Kattegat for firing exercises off Vinga. At 13.00 on 20th May, the Germans sighted the *Gotland* and reported it to German naval command. The Swedish crew also observed the Germans and



NAVAL HISTORY AND HERITAGE COMMAND

***Bismarck* as seen from the stern of the cruiser *Prinz Eugen*, while the two ships practised towing and refuelling with a bunker hose, April-May 1941.**

reported two Bismarck-class battleships and three destroyer escorts. Although the Swedes had mistaken the cruiser *Prinz Eugen* for a battleship, the German operation had nevertheless been compromised.

FOR THE GERMANS, the situation was serious. Would it be prudent to cancel the operation or to continue? The answer wasn't obvious, but an intelligence report said that the British Home Fleet remained at its main base at Scapa Flow in the Orkney Islands. Lütjens chose to continue towards Norway.

The passage through the Skagerrak is not very wide and a member of the Norwegian Resistance, Viggo Axelsson, spotted the German vessels off the south coast of Norway. The Germans were completely unaware that Axelsson passed on this intelligence to Britain as they headed towards Bergen and anchored there on 21st May. However, they did intercept a British message instructing an air unit to look out for two German battleships and three destroyers on a northerly course.

ADMIRAL JOHN TOVEY, commanding the Home Fleet, had several scenarios to consider. The most important was to prevent a German advance towards the Atlantic convoys. For this purpose, he had several battleships and an aircraft carrier at his disposal in Scapa Flow. Numerically, he had a clear advantage over Lütjens's squadron, but the fact that he had to cover several options made his task that much more difficult.

Another problem for Tovey was that some of his ships were so new that they'd not reached full combat readiness. The aircraft carrier *Victorious* had not received her full complement of aircraft and crews. The battleship *Prince of Wales* had not yet been fully trimmed, meaning that technicians from the suppliers were still on board making sure her heavy guns worked.

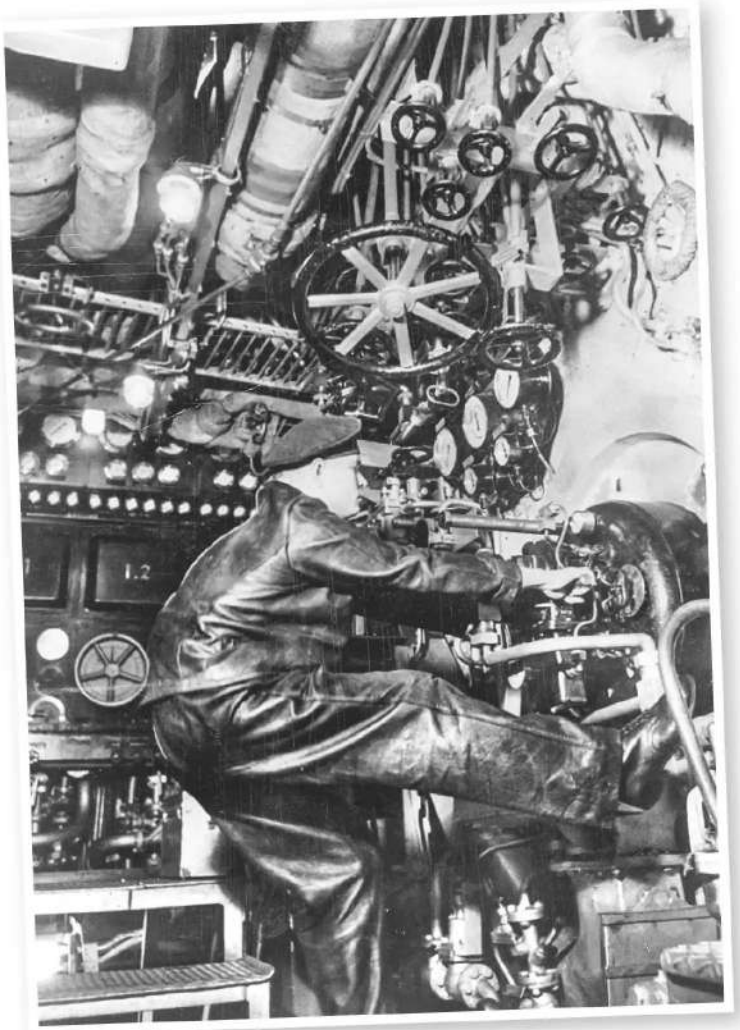
Unsure of what the Germans were up to, Tovey decided to compromise between waiting and taking full-scale action. The cruisers *Norfolk* and *Suffolk*, commanded by Rear Admiral Frederic Wake-Walker, were to patrol the Denmark Strait between Iceland and Greenland. Under Vice Admiral Lancelot Holland, the battleship *Prince of Wales* and the battlecruiser *Hood* sailed from Scapa Flow to reinforce Wake-Walker's cruiser force.

Meanwhile, Admiral Lütjens's force remained anchored in Norway. *Prinz Eugen* had a much shorter range than *Bismarck*, so Lütjens chose to top up the cruiser's fuel supply, but not the battleship's. His decision was controversial and would have serious repercussions later on.

ONE POSSIBLE EXPLANATION could be that Lütjens wanted to minimise the time spent in the fjord off Bergen to reduce the risk of detection. He may also have anticipated that his ship could replenish its fuel supplies from one of the German supply vessels stationed in the Atlantic.

Hopes of avoiding detection were not realised. A British reconnaissance aircraft had passed over Bergen and photographed the German ▶





SCHERL/SZ PHOTO/RITZAU SCANPIX

One of 12 Wagner high-pressure superheated boilers in *Bismarck's* engine room. The powerful engines gave the battleship an advantage.

ships. Both the Admiralty and Tovey had been informed. The British decided to launch bombing raids, but bad weather and darkness prevented them from finding the German vessels. Under cover of darkness, the ships had already left Bergen, which would not be confirmed until 22nd May. By then, Lütjens had already travelled a long way on his voyage towards the Denmark Strait.

As Lütjens had not refuelled *Bismarck*, he could have chosen to do so from the supply ship *Weissenburg*, which was stationed in the Arctic Ocean. This was not the case. Probably Lütjens judged, based on the weather forecasts, that conditions would be favourable for an incursion into the Atlantic in the coming days. It was important to remain vigilant while the chances of sneaking out undetected were good. Whatever the reason, *Bismarck* and *Prinz Eugen* kept to their course.

While the Germans sailed in the Norwegian Sea and up to the eastern part of the Denmark Strait, it was easy for them to abort the operation if they were discovered. As they entered the narrower part of the strait, their risk of being detected increased and their options shrank. When Able Seaman Newell of *Suffolk* sighted the German unit on the evening of 23rd May, the Germans couldn't see the British cruiser, but hydrophones and radar revealed that *Suffolk* was following. Soon German Naval Intelligence Service staff aboard *Prinz Eugen* had decoded the message in which Ellis reported what his ship had observed.

REAR ADMIRAL WAKE-WALKER led the British cruiser force on board *Norfolk*. He rushed to support the *Suffolk*. Unfortunately, *Norfolk* had an older radar, which was blind in several sectors, making it risky to approach the Germans. On board *Bismarck* and *Prinz Eugen*, the radar and hydrophone operators were able to track the British cruiser, which was approaching from the opposite direction.

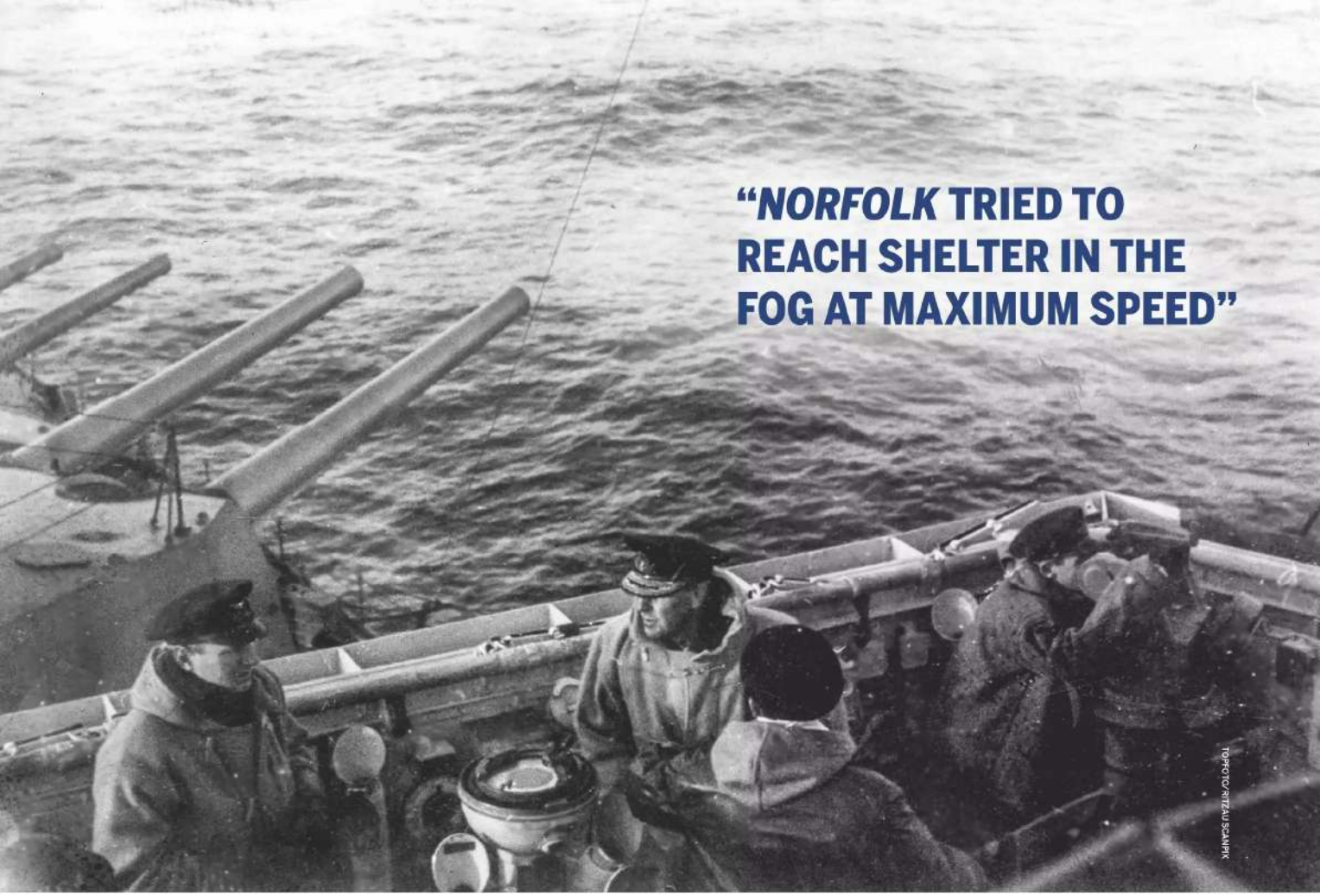
Knowing that his ship had been spotted by the British, Lütjens chose to break radio silence and sent a situation report to Group North. He also authorised both ship's commanders to open fire if the enemy appeared. At 20.30, the alarm went off on *Bismarck*, when the radar indicated a ship ahead. The fog was too dense to allow for firing, but the distance was rapidly shrinking.

Suddenly the fog cleared and *Norfolk* appeared in front of *Bismarck*, just 6,400 metres away. The artillery officer, Lieutenant Commander Adalbert Schneider, immediately gave the order to open fire. On board *Norfolk*'s bridge, Wake-Walker and the ship's commander, Captain Phillips, saw the German battleship. A moment later, lightning flashed from the muzzles of *Bismarck*'s heavy guns.

On the British ship, orders were immediately given to turn away and lay down smoke as *Norfolk* tried to reach shelter in the fog at maximum speed. *Bismarck* managed to fire five salvos, three of which were successful. Miraculously, though, the cruiser escaped being hit by anything other than shrapnel from the German shells.

THE TREMORS FROM the firing caused damage to *Bismarck*'s forward radar, prompting Lütjens to switch the German ships' positions. *Prinz Eugen* took the lead and scanned forwards with her radar, while the battleship focused on the rear. It was here where the two British cruisers lurked, needing to remain close enough not to lose contact, but far enough away so that it was pointless for the Germans to open fire.

For Tovey, the situation was now clearer. He knew that his own force would hardly be able to catch up with the Germans. However, Vice Admiral Holland was well placed to attack them, provided Wake-Walker's cruisers could maintain contact



Rear Admiral Frederic Wake-Walker on the bridge of his flagship *Norfolk*, May 1941.

with the enemy and guide the heavy British ships towards their targets.

One concern for the British was that *Bismarck* had a much greater range than her British counterparts. At the high speeds at which the ships were travelling, this could make a big difference. The Germans also had supply ships in the Atlantic, from which they could refuel if they lost their pursuers. The British, on the other hand, had not deployed supply ships, relying instead on bases in Iceland or Canada. In this situation, combined with their limited range, chasing the German ships at high speed could potentially work against them.

ABOARD HMS HOOD, Vice Admiral Holland considered how to conduct the impending battle with the German force. For the time being, he maintained radio silence, as it was important that the Germans remained unaware of his presence.

On paper, his force had an advantage, with a battleship and a battlecruiser against a German battleship and a cruiser. Holland could also call on escort destroyers as well as Wake-Walker's cruisers. In addition, he had a good chance of surprising the Germans, if Wake-Walker kept in touch.

Wake-Walker's task was not easy. The Germans were moving at extremely high speed in a south-westerly direction, and had it not been for *Suffolk*'s modern radar, the task might have proved beyond them. Early on 24th May, Lütjens's unit had passed the narrow part of the Denmark Strait to give him more room to manoeuvre. It was urgent that Holland intercept the Germans. If they got further out into the Atlantic, the chances of catching them would quickly vanish.

IN ADDITION TO these considerations, the projected battle caused headaches for Holland. His two battleships were quite different. HMS *Prince of Wales* was brand new and her guns not fully trimmed, which could have serious consequences. The battlecruiser *Hood*, on the other hand, was quite old. Construction had begun during World War I, when British battlecruisers were sunk during the Battle of Jutland in 1916 after their ammunition magazines exploded. Although some of the lessons learned had been incorporated into the design of HMS *Hood*, her protective armour was outdated.

As *Hood* had weak deck armour, Holland wanted to reduce the distance to the Germans as quickly as possible, as the projectile paths would be flatter and thus make the deck less vulnerable. This meant, on the other hand, that he ran the risk that only the

Article continues on page 114 ▶

COMBATANTS IN THE DENMARK STRAIT

During the naval battle on 24th May 1941, four ships played the main roles: *Bismarck* and *Prinz Eugen* on the German side, *Hood* and *Prince of Wales* on the British. It led to a short-lived tactical victory.

Main artillery Eight 38-centimetre guns spread over four turrets. The turret guns could be raised and fired independently. The rate of fire was two or three shots per minute and the projectiles weighed 800 kg each. The guns' range was 35,550 metres.

Secondary artillery Twelve 15-centimetre guns spread over six twin turrets. The rate of fire was six to eight rounds per minute and the guns had a range of 23,000 metres.

Heavy anti-aircraft battery
Sixteen 10.5-cm guns with a rate of fire of 18 rounds per minute. Their range was 17,850 metres.

PRINZ EUGEN

Type:	Heavy cruiser
Into service:	1st August 1940
Width:	21.8 m
Length:	212.5 m
Displacement:	16,970 tonnes
Top speed:	33.5 knots
Range:	6,800 NM*
Crew:	1,600

**Range in nautical miles at 20 knots*

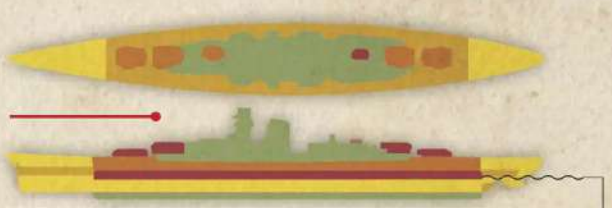
Main artillery:
Eight 20.3-centimetre guns. Their range was 33,500 metres.

HMS HOOD

Type:	Battlecruiser
Into service:	15th May 1920
Width:	31.8 m
Length:	262.3 m
Displacement:	42,670 tonnes
Top speed:	31 knots
Range:	5,332 NM*
Crew:	1,419

Secondary air defence Sixteen 3.7-centimetre and 18 2-cm guns.

Armour The strongest sections of armour protected *Bismarck's* waterline and gun turrets.



Thickness of armour
19 mm · 50–60 mm · 220
32 mm · 130–160 mm · 340 mm

Waterline

ILLUSTRATIONS
HTTPS://WORLDOFWARSHIPS.EU
GRAPHICS: JOHNNY ÖBERG

Propulsion *Bismarck's* three triple-bladed propellers were driven by 12 Wagner superheated steam boilers and three Brown-Boveri turbines.



Fire control The main and secondary artillery were directed from three towers. Each bridge was equipped with stereoscopic rangefinders, manufactured by Zeiss, and FuMO 232 radar.

Catapult A 32-metre-long double-ended catapult was used to launch or lift *Bismarck's* four Arado Ar 196 seaplanes.

BISMARCK

Type:	Battleship
Into service:	24th August 1940
Width:	36 m
Length:	251 m
Displacement:	41,700 tonnes
Top speed:	30.1 knots
Range:	6,640 NM*
Crew:	2,065

**Range in nautical miles at 24 knots*



**Range in nautical miles at 20 knots*

Main artillery:
Eight 38.1-centimetre guns. Their range was 30,680 metres.

HMS PRINCE OF WALES

Type:	Battleship
Into service:	19th January 1941
Width:	31.4 m
Length:	227.1 m
Displacement:	40,642 tonnes
Top speed:	28.3 knots
Range:	5,740 NM*
Crew:	1,521

**Range in nautical miles at 17 knots*



Main artillery:
Ten 35.56-cm guns. Their range was 38,600 metres.

forward artillery could engage the Germans. These were the kinds of trade-offs that it was Holland's job to choose between, but he had no firm evidence to call on.

FOR THE BRITISH cruisers in the Denmark Strait, the situation became even harder at midnight when visibility deteriorated further. The Germans laid down smoke and increased their speed to 30 knots, while intercepting and deciphering British radio traffic. Soon, decoded messages revealed that the British had finally lost contact, to Lütjens's benefit.

Holland received the radio messages and realised the dilemma he was in. Unless Wake-Walker's cruisers could guide him, his chances of finding the Germans were extremely slim. They began to prepare a Walrus reconnaissance aircraft on the *Prince of Wales* to search for the Germans as soon as light and visibility allowed.

Then, at 03.28, *Suffolk* again made radar contact with the German force. The Germans, for their part, also sighted *Suffolk*, which left Lütjens disappointed. Perhaps at this point he got the impression that the British ships were equipped with such advanced surveillance systems that it was impossible to shake them off. The Germans had believed the British lagged behind in the development of radar, but the incident might have convinced them otherwise.

For Holland, the news that *Suffolk* had regained contact with the Germans was not all positive. The manoeuvres that had taken place while contact was lost had left him in a less favourable position. He was now forced to approach the German ships at an angle that was tactically unsuitable. Furthermore, he had to maintain 28 knots, the maximum speed for *Prince of Wales*, to intercept the Germans. If he failed to catch up with them before they moved south of the southern tip of Greenland, they would be able to turn westwards and use their higher speed to escape. Holland felt he had only one chance and he had to take it.

"HOLLAND FELT HE HAD ONLY ONE CHANCE AND HE HAD TO TAKE IT"

ON BOARD THE British ships, crews prepared for the coming battle. Hatches for watertight bulkheads were closed. Under the gun turrets, lifts hummed as cordite bags were brought up to be close at hand when the guns were reloaded after the first shots.

Able Seaman Bob Tilburn, stationed at one of the 10.2-centimetre guns on the port side of *Hood*, pondered the unknown that lay ahead.

"Everyone was prepared as far as they could be," he recalled. "Everyone knew that there would be casualties, but it would be someone else, not you. No one thought that the *Hood* would be sunk. No



US NAVAL HISTORY AND HERITAGE COMMAND

***Bismarck* opens fire on HMS *Prince of Wales* in the Denmark Strait.**

one gave it a thought. But there would be casualties, which were to be expected."

On *Prince of Wales*, the ship's commander, Captain John Leach, gave a short speech to the crew over the loudspeakers. His speech was followed by the ship's chaplain, who prayed: "O Lord thou knowest how busy we must be today. If we forget thee, do not thou forget us."

MEANWHILE, THE WEATHER changed. The sun began to appear over the horizon in the east, tingeing the clouds orange. The wind remained strong and the sea was rough. Large waves from the north-east broke over the bow of the British battleships. The cloud cover promised more rain. For the hardened sailors, this did not attract much attention, but suddenly, at 05.35, a cry was heard from the lookout: "Alarm starboard green 40!"

At a great distance, around 27 kilometres, a suspicious object could be seen. It was *Bismarck*. *Hood*'s commander, Commodore Ralph Kerr, gave the order to send an urgent message to the Admiralty and the head of the Home Fleet.

Signalman Ted Briggs on *Hood*'s bridge felt the tension rise. No longer able to keep quiet, the 18-year-old whispered to one of the yeomen next to him, "How long do you think this is going to last, Yeo?" After the war, he remembered the question as being somewhat "silly", but the NCO looked at him in surprise and kindly replied, "I think it'll all be over within the next couple of hours, Ted." His prediction would prove to be accurate.

The Germans already knew that the enemy was nearby. Their hydrophone operators had picked up the sound of the British battleships and signalled the bridge. They did not know exactly what to expect, but they had a relatively good idea of the British ships' movements. Since previous aerial reconnaissance reports over Scapa Flow had mistakenly indicated that the Home Fleet's heavier ships had remained there when Lütjens had begun the breakout attempt, the Germans did not believe any battleships were nearby.

Soon the masts of the British ships became visible and the Germans assumed that they belonged to cruisers. It was important to identify the targets correctly, because the German ships used different shells depending on whether the target was a cruiser or a battleship.

The Germans remained on a south-westerly course for the time being, while the British approached them from a slight angle. Holland's original plan was to approach the Germans in such a way as to cross their course, but with the loss of contact during the night, the ship was now positioned diagonally behind the Germans on their port side. This meant that he was either forced to start the battle with only the forward artillery, while trying to reduce the distance, or he could turn to bring all the guns to bear, but at the cost of fighting the battle at a great distance. The latter option was deemed to be unsuitable by the British.





Above: The last photo of HMS *Hood* in fighting condition, taken from HMS *Prince of Wales*. Below: Vice Admiral Holland commanded *Hood*.

Instead, Holland decided to try to close the distance as quickly as possible. When he was close enough, he planned to turn to port, so that all his heavy guns could be fired. Lütjens made a slight turn, so that *Bismarck* and *Prinz Eugen*'s most powerful guns could be used from the start. The Germans remained unsure what ships had recently been sighted. But they seemed to be prepared for battle. Gunnery officers Jasper and Schmalenbach, in the fire-control tower of *Prinz Eugen*, made a wager for a bottle of champagne. Jasper argued that the two ships were cruisers; Schmalenbach, however, was convinced that they were up against *Hood*.

Opinions were also divided on *Bismarck*. Gunnery officer Schneider judged that the British ships were cruisers and gave orders accordingly. Commander Albrecht in the forward fire-control tower objected on the intercom and claimed they were battleships.

AN OBVIOUS DISADVANTAGE for the Germans was that *Prinz Eugen* was a cruiser and therefore much less heavily armed and armoured. On the other hand, the British ships were travelling against the wind and waves splashed over the prow, making range measurements difficult. Instead, fire had to be directed from the central tower, whose range instruments weren't as effective. In addition, there was a risk that *Prince of Wales*'s guns would suffer from breakdowns, as the ship was not trimmed.

On board the opposing ships, tensions rose. The distance gradually decreased as the officers ▶

scrutinised the enemy through their binoculars. Up on *Hood*'s bridge, Ted Briggs wasn't concerned with the same details as his officers; he focussed on his own duties, remembering the Battle of Oran in the Mediterranean less than a year earlier. Then it had been a battle against targets sitting idle in port. What now awaited was something else entirely. He later recalled that, "My own feelings were a mixture of apprehension, wild excitement and fear," but that, "I do not think there was a soul aboard who did not consider our mighty *Hood* and her consort more than a match for *Bismarck* and *Prinz Eugen*."

SEVEN MINUTES REMAINED before the clock struck 06.00 on the morning of 24th May 1941. *Hood* was steaming along at 28 knots when Vice Admiral Holland gave the order to open fire. A few seconds later, the battlecruiser's forward guns flashed. Four projectiles weighing over 800 kilograms were launched, meant for the enemy battleship, which was 23,000 metres away. Not realising that the German ships had changed places in the formation, however, *Hood* directed her shells towards *Prinz Eugen*.

On board the German cruiser, the huge muzzle flashes were observed. "Blast!" exclaimed Jasper on board *Prinz Eugen*, who now realised his mistake. "Those guns are not mounted on any cruiser. They are battleships."

Schmalenbach had won his bet with Jasper, but would he get the chance to claim the bottle of champagne? On board *Bismarck*, Schneider requested permission to open fire. Lütjens hesitated. His task was not to engage heavy British units. The purpose of the operation was to attack convoys without taking unnecessary risks. Should he turn and try to outrun the British? As he pondered, the British shells continued their journey towards their targets. Engineman Josef Statz, who was stationed in the damage-control centre, heard the roar of the shells through one of the *Bismarck*'s air intakes. He recalled: "They literally whipped the noise through my body. A noise that cannot be described."

New muzzle flashes appeared from the British ships, but Lütjens remained unconvinced. Turning away was risky, as he would only be able to count on *Bismarck*'s four aft heavy guns. This would be a huge disadvantage, as it could take time to get beyond the range of the British ships. Of course, going into battle was also a major risk, leaving his ships damaged far from their home ports. Schneider and Lindemann both wanted to return fire and eventually Lütjens made his decision: "Open fire!"

On *Hood*, Able Seaman Tilburn saw *Bismarck*'s guns being fired and realised that his ship was the target. On board *Bismarck*, Captain Müllenheim-Rechberg was in the aft fire-control tower. He had

"HE SAW A GREAT PLUME OF FLAME SHOOT UP ON BOTH SIDES OF THE BRIDGE"

been assigned to watch *Norfolk* and *Suffolk* but was listening to the orders through his headset. Schneider directed the fire from the main fire-control tower. Müllenheim-Rechberg heard that the first volley was too short, but the second volley was already on target. Then Müllenheim-Rechberg heard Schneider's shout: "Straddling! Full salvos good rapid!"

The two German ships quickly adjusted their guns and fired at *Hood*. Until this point, the British battlecruiser hadn't spotted her mistake in targeting *Prinz Eugen* instead of *Bismarck*, but now that Holland realised his error, he gave the order to change target. But at that moment, *Hood* was hit. "The ship shuddered," Briggs recalled. A fire had started in the magazine for the 10.2-centimetre anti-aircraft guns. Orders went out to put out the fire, but no sooner had this happened than a 20.3-centimetre shell from *Prinz Eugen* punched through the foretop without exploding. The violent impact caused several soldiers to fall from the mast, some of whom were dead before they hit the deck.

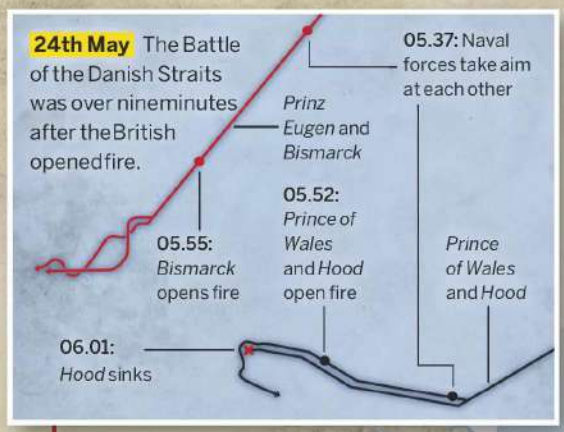
HOLLAND HAD INTENDED to reduce the distance of the battle as quickly as possible and then turn so that all his heavy artillery could be directed towards the enemy. It was now 06.00 and the battle had lasted only seven minutes. The distance had dropped to just over 16,000 metres, which prompted Holland to order a port tack, so that the rear gun turrets could also be fired.

Hood began to turn, while the gun crews prepared the next salvo. The shells from the *Bismarck*'s fifth salvo were already heading for the British battlecruiser and as it turned up its broadside, one of the German shells hit. "I did not hear any explosion," recalled Briggs, who was thrown to the deck. He saw a great plume of flame shoot up into the air on both sides of the bridge, as if he were inside a huge welding torch.

It's likely the shell from *Bismarck* had broken through the armour of the magazine of the rear 10.2-centimetre guns and ignited the cordite stored there. The pressure from this explosion shattered surrounding bulkheads and ignited other magazines. Coxswain French, aboard *Prince of Wales*, watched as the second rear gun turret on the *Hood* lifted from its bed and rolled off the ship. Inside the ship, the explosion spread and cracked the entire hull. Only a few people saw the explosion,

The hunt for Bismarck

Operation Rheinübung was supposed to mark the German squadron's foray into the Atlantic with the aim of cutting off shipping traffic to the British Isles. But in the Denmark Strait, *Bismarck* and *Prinz Eugen* were spotted by British warships.



23rd May *Norfolk* and *Suffolk* sight the German squadron and begin shadowing *Bismarck* and *Prinz Eugen*.

22nd May British reconnaissance aircraft confirm that *Bismarck* and *Prinz Eugen* have departed Bergen.

GREENLAND
DENMARK STRAIT
ICELAND
Pack ice
NORWEGIAN SEA
NORWAY
Bergen
NORTH SEA
IRELAND
GREAT BRITAIN
ATLANTIC
FRANCE
Brest
PORTUGAL
SPAIN
Gibraltar

Bismarck and *Prinz Eugen*
Hood and *Prince of Wales*
Home fleet
Suffolk
Norfolk
Prince of Wales
Rodney
Bismarck
Edinburgh
Dorsetshire
Force 'H'
Prinz Eugen

1

27th May A torpedo destroys *Bismarck's* rudder and she loses the ability to steer. She is finally sunk by *Dorsetshire*.

2

3

4

5

25th May *Bismarck* is attacked by torpedo planes from the aircraft carrier *Victorious*, but manages to escape.

6

7

24th May *Prinz Eugen* manages to escape the pursuing British with *Bismarck's* support.

26th May British reconnaissance aircraft spot *Bismarck* again.

"THE GERMAN CREWS CHEERED AS *HOOD* EXPLODED"



U.S. NAVAL HISTORY AND HERITAGE COMMAND

***Bismarck* fires a volley at *Hood*, photo taken from *Prinz Eugen*, 24th May.**

▶ but they had different images of it: "like a vast blow-lamp", "a red-white glow, shaped like a funnel", "like a bunch of red rhubarb" or "like a long pale red tongue of fire". Other descriptions included "a sea of fire shaped like a fan or an inverted cone" and "a very thin column of fire, reaching between 200 and 300 metres up in the air". However, everyone agreed on one thing – no sound was heard.

ON HOOD'S BRIDGE, it took a few seconds for the disaster to become clear. "The compass is out of action," said the officer of the watch in a calm voice. "Steering's gone, sir," reported the helmsman over the voice tube. "Change over to emergency steering," ordered the captain.

What remained of the ship began to list with increasing speed. Briggs recalled that there was no panic and no order to abandon ship. There was no need for such an order – the situation was obvious. As the signalman left the bridge, Commander John Warrand let him pass with a smile. In the doorway, Briggs stopped short and glanced over his shoulder. He saw Holland huddled in his chair, resigned to his fate. That was the last Briggs saw before the rising waters enveloped him.

The German crews cheered as the British battlecruiser exploded. Müllenheim-Rechberg could not make out what was being said in the cacophony of his headset. Instead, he moved to the port side view and saw something he would never forget:

"While I was still turning [the director] towards the *Hood*, I heard a shout, 'She's blowing up!' 'She' – that could only be the *Hood!* The sight I then saw is something I shall never forget. At first the *Hood* was nowhere to be seen; in her place was a colossal pillar of black smoke reaching into the sky. Gradually, at the foot of the pillar, I made out the bow of the battlecruiser projecting upwards at an angle, a sure sign that she had broken in two. Then I saw something I could hardly believe: a flash of orange coming from her forward gun! Although her fighting days had ended, the *Hood* was firing a last salvo. I felt great respect for those men over there."

FOR THE MEN on *Prince of Wales*, the immediate reaction was to steer clear of the battlecruiser's wreckage, but they soon realised that the German fire would now be directed at them. They didn't know it yet, but only three men from *Hood* – Ted Briggs, Bill Dundas and Bob Tilburn – would survive the disaster. The other 1,416 on board followed the battlecruiser into the depths.

Prince of Wales suffered a firing malfunction with several of her guns, but worse was to come. *Bismarck* switched targets and the first salvo was already incoming. A shell arrowed into the bridge, continuing straight through and out the other



IMPERIAL WAR MUSEUM

Sailors in front of *Hood's* 38.1-cm guns, circa 1940. Of the ship's complement of 1,419 men, only three survived.

side, yet without detonating. Nevertheless, most of the crew there were killed or wounded. The ship's commander, Captain Leach, was among the few survivors. Several hits were recorded. Radar systems and visibility were destroyed. In total, the British battleship was hit by four shells from *Bismarck* and three from *Prinz Eugen*. One of *Bismarck*'s shells hit *Prince of Wales* below the waterline, entering the ship and coming to rest near one of the generator rooms. Fortunately for the British, it was a dud, but the shell could only be removed later in dry dock.

The successful strikes from the German ships, who'd apparently set their sights correctly, coupled with the misfiring guns, prompted Captain Leach to call off the battle just four minutes after the devastating hit on *Hood*. He veered off to port, hoping to escape the Germans. On *Bismarck*, opinion was divided. Captain Lindemann wanted to continue the battle and sink the British battleship. Lütjens, on the other hand, wanted to continue the operation according to the instructions he'd received. The Germans also had no idea that they were facing *Prince of Wales* with her unreliable heavy guns. They believed they were up against sister ship *King George V*, which had been launched earlier and was well trimmed.

Lütjens decided to call off the chase. His concern was that *Bismarck* had also been hit – by three shells, none of which caused any damage to the weapons systems or propulsion machinery. The ship's armour was intact, but one of the shells had hit a fuel oil tank in the bow and continued out the other side. This had caused *Bismarck* to take on water in the forecastle with the loss of around 1,000 tonnes of fuel. In addition, the leaking oil left a trail in the water behind the ship, making her easier to track by any pursuers.

PRINCE OF WALES moved to accompany the British cruisers shadowing the German unit. It was hoped that this would enable them to lead the Home Fleet's main force into battle with the Germans. As yet, Admiral Tovey's ships were too far away, but if the Germans followed a more southerly course, there'd be an opportunity for him to intercept them.

The damage to *Bismarck* left Lütjens deciding to cancel the operation. With the loss of fuel, the range was limited and any element of surprise had obviously gone. Moreover, Lütjens appeared to believe that British radar made the operation too risky. He therefore chose to take a more southerly route, aiming to call at St Nazaire on the French Atlantic coast. There he would be able to repair the damage to the bow and refuel.

The German squadron carried on the southerly course while everything the British could scrape together was ordered to take up the hunt for ▶



The aircraft carrier HMS *Ark Royal*, with Fairey Swordfish torpedo aircraft in the air, 1939.

US NAVAL HISTORY AND HERITAGE COMMAND

► *Bismarck*. Several battleships and other warships had to abandon their duties and set course for the German ship that sank *Hood*.

In due course, these measures could have an effect, but for now Tovey pinned his hopes on the aircraft carrier *Victorious*. He hoped to launch an air strike before nightfall.

BEFORE THAT, THE Germans carried out a manoeuvre to allow *Prinz Eugen* to shake her pursuers and go to a supply ship for refuelling. *Bismarck* turned towards the pursuing British and opened fire, while the German cruiser increased its speed and escaped. It would survive the entire war. This left *Bismarck* utterly alone.

HMS *Victorious* was brand new but her aircraft crews weren't sufficiently trained. It wasn't guaranteed that they'd be able to carry out a successful attack on the German battleship. Moreover, time was running out before they came within range so the aircraft could reach the German battleship. Darkness was approaching, but the situation was desperate. *Bismarck* steamed on and appeared to have avoided any serious damage during the battle in the Denmark Strait. Despite the approaching darkness, Tovey decided to launch an air attack with the untrained crews.

The mission proved difficult. Flying to *Bismarck* was reasonably easy, as Wake-Walker's ships had maintained contact, but then they had to hit the German battleship with torpedoes before finding their way back to the carrier in the dark. The poorly

"THE NAVY'S LAST HOPE WAS ... TO CARRY OUT AN AIR STRIKE"

prepared pilots carried out the mission as best they could. They managed to hit the German battleship with a single torpedo, before returning to try to locate *Victorious* in the dark.

The torpedo hit *Bismarck* amidships where she was very well protected and it caused no significant damage. However, the violent manoeuvring and speed increase during the air raid had damaged the flooding control arrangements that had been made near the bow, which created new headaches for Lütjens.

During the night of 24th-25th May, Wake-Walker continued to shadow the German battleship. Tovey hoped to get close enough to engage the battleship *King George V*, along with *Prince of Wales*. This required maintaining contact, as the weather continued to limit visibility.

AT 03.00 ON 25th May, Lütjens made a counter-move. He turned suddenly to starboard and completed a turn of about 300 degrees, setting a course to the south-east. So far, *Suffolk* had kept in touch thanks to its radar, but because the British feared German U-boats operating in the area, they sailed on a zigzag course. Wanting to keep out of range of *Bismarck*'s guns even when the battleship was closest, *Suffolk* lost radar contact when she was

far to port. It was probably at such a moment that *Bismarck* turned starboard and escaped.

For Tovey, this was particularly ominous. Without knowing the Germans' position, it would take a good deal of luck to regain contact. Surprisingly, Lütjens gave him the chance to do so. At 10.12 on 25th May, Lütjens sent a lengthy message to the German naval command. Apparently, Lütjens did not believe that he'd lost his pursuers. He indicated that the enemy had radar with a range of at least 35 kilometres (a considerable overestimate), which made operations of the type being proposed difficult to carry out.

BISMARCK'S TRANSMISSION WAS picked up by stations in the British Isles, allowing the German ship to be located. However, a mistake was made, leading the British to believe that *Bismarck* was further south than she was. Lütjens's mistake therefore led Tovey to search in the wrong place and gave *Bismarck* a substantial lead. Although the British would realise their mistake, the damage was already done.

For 24 hours, *Bismarck* sailed towards the French Atlantic ports without the British knowing where she was, but at 10.30 on 26th May, the battleship was spotted by a reconnaissance aircraft, far off the west-south-west of Ireland. This was encouraging for the British, but at the same time the fuel situation had become acute. Several British ships were forced to seek port. Tovey was too far away to catch *Bismarck*. Only one hope remained.

In Gibraltar was Force H, which had previously been ordered to leave and head north into the Atlantic. The force included the aircraft carrier HMS *Ark Royal*. The Navy's last hope was that the carrier would be able to carry out an air strike before darkness fell. An attack could be launched as early as 15.00, but the aircraft crews made a serious mistake and attacked the British cruiser HMS *Sheffield* instead. Yet their misfortune turned out to be lucky. The torpedoes' magnetic detonators proved defective and the cruiser remained undamaged. Time passed before a new attack could be initiated with new detonators, but another attempt was made. At around 21.00, the aircraft found *Bismarck* and attacked. Four torpedoes hit the German battleship, three of them doing no significant damage. But the fourth struck *Bismarck*'s rudders and made the ship impossible to steer.

The hit in the rudder section effectively doomed *Bismarck*. The British could now catch up with the ships they needed. In addition, the damage meant that *Bismarck* could not keep her course, leaving her to steer directly towards the enemy. On the morning of 27th May, the battleships *Rodney* and *King George V* began the final battle. The outcome was a foregone conclusion. The German battleship was hit by a very large number of shells but refused to sink. The damage weakened *Bismarck*'s fighting ability, however, and after an hour of firing, her guns fell silent. The German battleship still floated, but orders were given to the crew to scuttle their ship. Pumps were reversed and watertight hatches were opened as the surviving crew members abandoned ship. In the final stages, the British cruiser *Dorsetshire* also fired torpedoes that hit *Bismarck*.



IMPERIAL WAR MUSEUM

***Bismarck's* surviving crew are helped to board the *Dorsetshire*, 27th May 1941.**

WHEN THE BATTLESHIP sank, many of her crew ended up in the water, or on anything that floated. It's impossible to know how many died during the battle, but it is estimated that over a thousand men remained in the water. The British began trying to rescue them, but they had only taken just over a hundred on board when a lookout spotted a suspected submarine, leading the British to abort the rescue operation. In all, only 115 of *Bismarck*'s 2,000-plus crew survived.

The sinking of the *Bismarck* was not just the last voyage for so many seamen – it would also mark the end of German attempts to attack Atlantic convoys with battleships.

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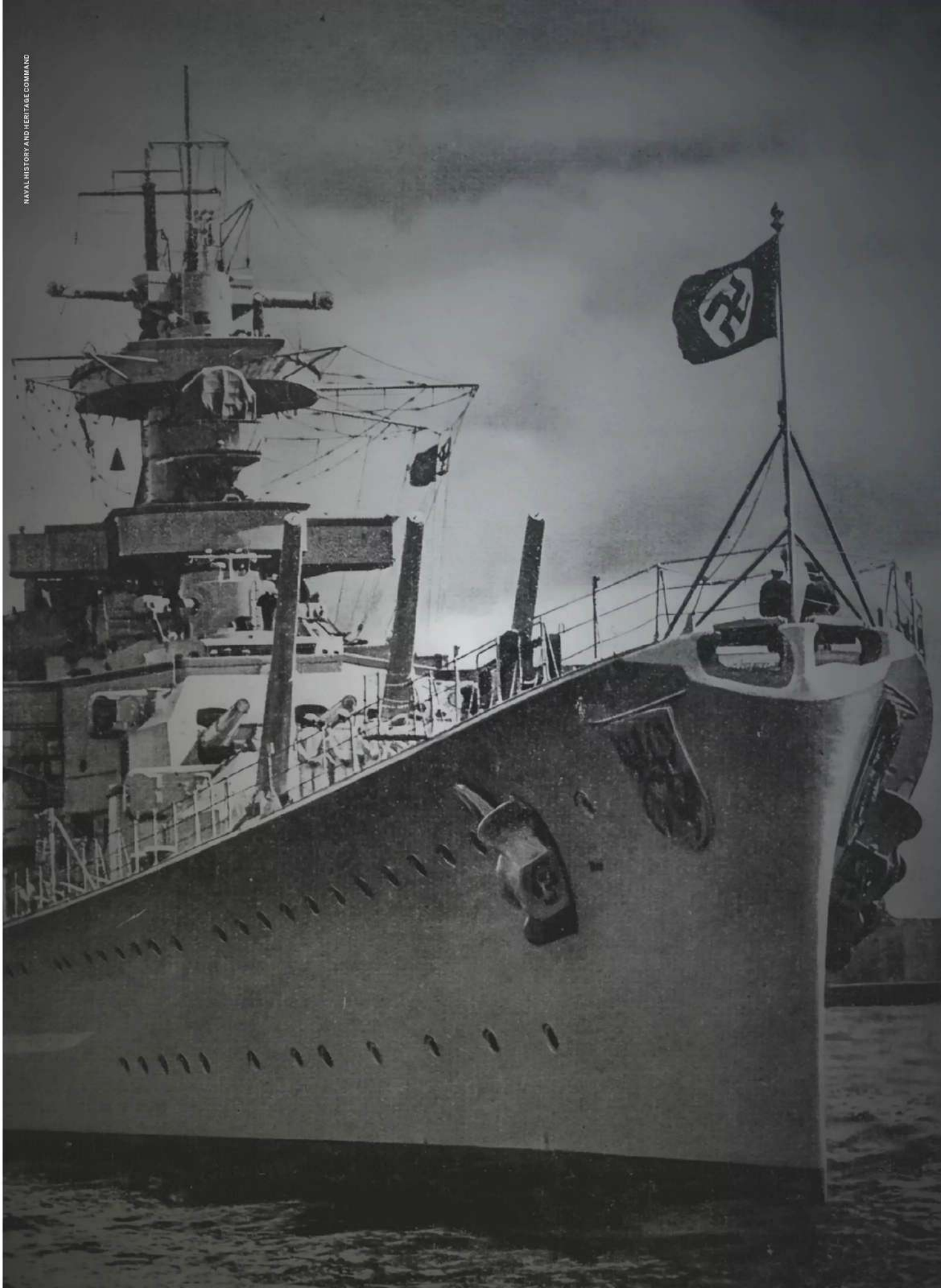
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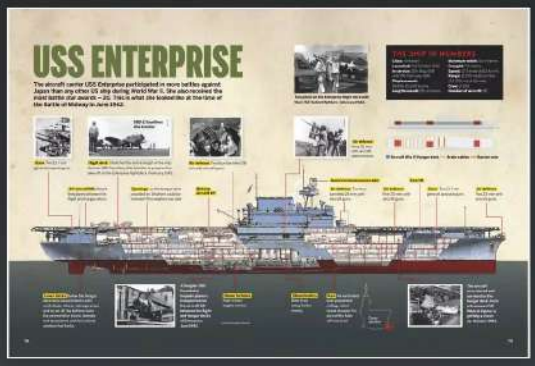
NAVAL HISTORY AND HERITAGE COMMAND

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